

ALBUM № A-1
АНК-5В autopilot
operating instruction.
/2-nd edition/

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ALM-5B

AUTOPILOT OPERATING INSTRUCTIONS

(2-58 edition)

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AIG-5B AUTOPILOT OPERATING INSTRUCTIONS

(2nd edition)

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P R E F A C E

The "AHK-5B Autopilot Operating Instructions" are intended for the plants, manufacturing "KC" winged missiles, and mechanical personnel of the using organizations.

The "AHK-5B Autopilot Operating Instructions" are the manual for storage, shipment, installation, checks and maintenance of the AHK-5B autopilot within the guaranteed service life.

The main form of storing the AHK-5B autopilot is keeping it in the "KC" winged missile being preserved in accordance with the present instructions KC-05-WM, edition III for preservation and extended storage of the "KC" missile in the depots for one year since the date of arrival to the point of destination.

The complete autopilot equipment may be installed in the "KC" missile or the H-2 gyro unit may be removed from it; in this case this unit is stored in a special metal tare.

The AHK-5B autopilot is permitted to be stored in the "KC" missile in a hangar for 3 months within the entire guaranteed service life.

The AHK-5B autopilot and its individual units which are not installed in the "KC" missile can be stored in the depots packed in special metal tare for one year since the date of arrival to the point of destination.

The AHK-5B autopilot and its individual units can be transported in tare or installed in the "KC" missile.

The requirements for the ANK-5B autopilot shipment are outlined in these instructions. The autopilot installed in the "KC" missile is shipped in accordance with the "KC" Winged Missile Maintenance and Operating Instructions", Book I.

The autopilot must be installed in and removed from the "KC" missile according to the "KC" Winged Missile Maintenance and Operating Instructions" Book I.

The amount and methods of the ANK-5B autopilot checkouts at the "KC" missile manufacturing plant, during an extended storage and also during the pre-flight test and test before a take-off are given in these instructions.

SECTION I

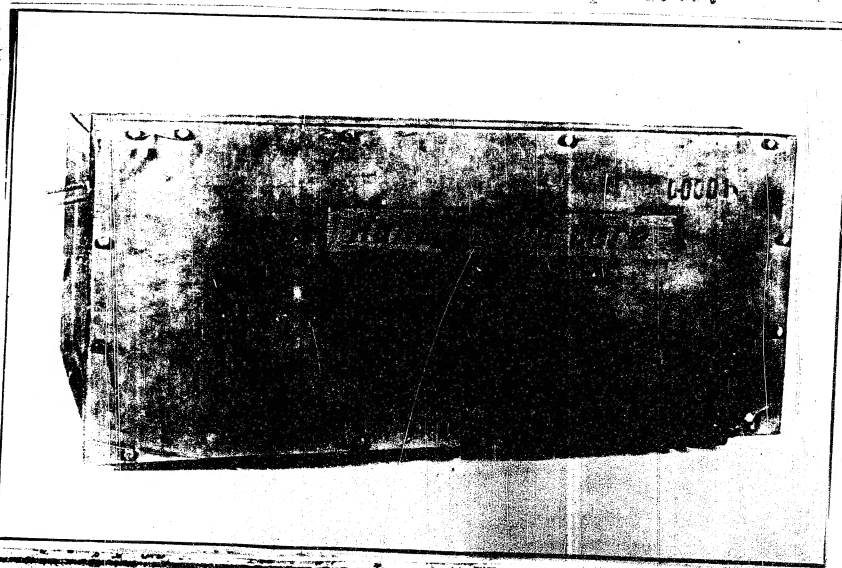
PACKING AND SHIPMENT OF THE ANK-5B AUTOPILOT

I. INSTRUCTIONS FOR PACKING THE ANK-5B AUTOPILOT UNITS IN
TARE

1. The tare for the ANK-5B autopilot consists of 2 welded metals cases. Packed in one of the cases are II-1 and II-2 units and in the other - II-4 and II-18MO units and HAP-10A inverters. The cases are made according to drawings No.399.00.00.000 (for II-1 and II-2 units) and No.400.00.00.000 (for II-4, II-18MO units and HAP-10A inverters).

The external view of one of the cases is given in Fig.1. Furnished with the metal case made according to dwg.No.399.00.00.000 is the box (dwg.399.01.00.000) with the plug connectors.

2. The rooms in which the ANK-5B autopilots are packed should meet the requirements indicated in para.10.



3. Pack the II-1 control panel and II-2 gyro unit in boxes as follows:

Install the II-1 control panel on the shock mounts (2) of the mounting (1, Fig. 2) and secure it by 4 screws with nuts. Pack the cables plug connectors with two sheets of oil paper (FOOT 1760-51) and herringbone tape and bind the tape with linen threads.

Insert the plug connectors in the holders (3). Secure the cables by the tape with the button (4). Fasten the control panel filter in the clamp (6).

Install the II-2 gyro unit on the shock mounts (2) of the mounting (1, Fig. 3) and secure by 3 bolts. Attach the II-2 gyro unit plug connectors No. 31, 39, 42 (manufactured especially for the II-2 gyro units) 43, 45 and 47 to the flanges (3) using their coupling nuts. Fasten plug connector No. 35 to the flange (4) by a coupling nut.

Cover the bent portions of cables No. 39, 42 and 43 with a split chlorvinyl tubes (7, dia. 34) and secure them by the tape with the button (8) to the mounting.

Secure cables No. 31, 35 and 44 by the tape with the button (9), cover them with the split chlorvinyl tube (10) and fasten them to plug connector No. 35 by the tape with the button (11). Cover cables No. 45 and 47 with the split chlorvinyl tube (12) and fasten them to plug connector No. 45 by the tape with the button (10, Fig. 3).

Secure the II-2 gyro unit filter to the mounting with the II-1 control panel by means of a clamp and plug connector No. 44 by means of its coupling nut - to the flange located on the same mounting.

Move the mountings with the H-I and U-2 units installed along the guide rails into the case placed on the floor; see that the mountings are in the vertical position. The mountings must move along the rails without shaking and sticking. If necessary, bend the guide rails.

Secure cables No.45 and 47 to cable No.44 by the tape with the button (1) and place them in the box (2, Fig.4) manufactured according to dwg. No.399.04.00.000, with the plug connector mating parts furnished with the autopilot set.

NOTE: The chlorvinyl tubes may be substituted by chlorvinyl tape.

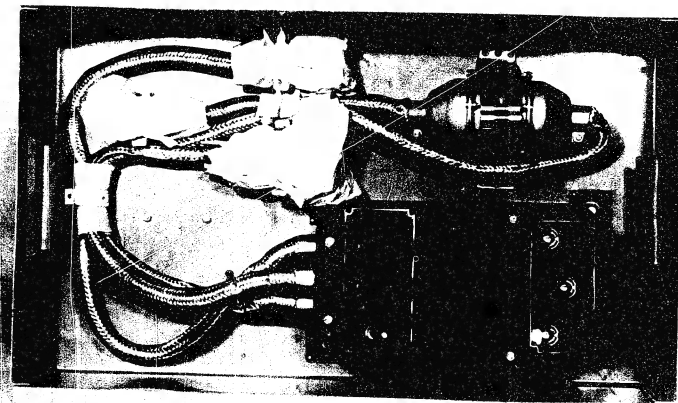


Fig. 2. H-I

Control Panel-to-Mounting
Attachment

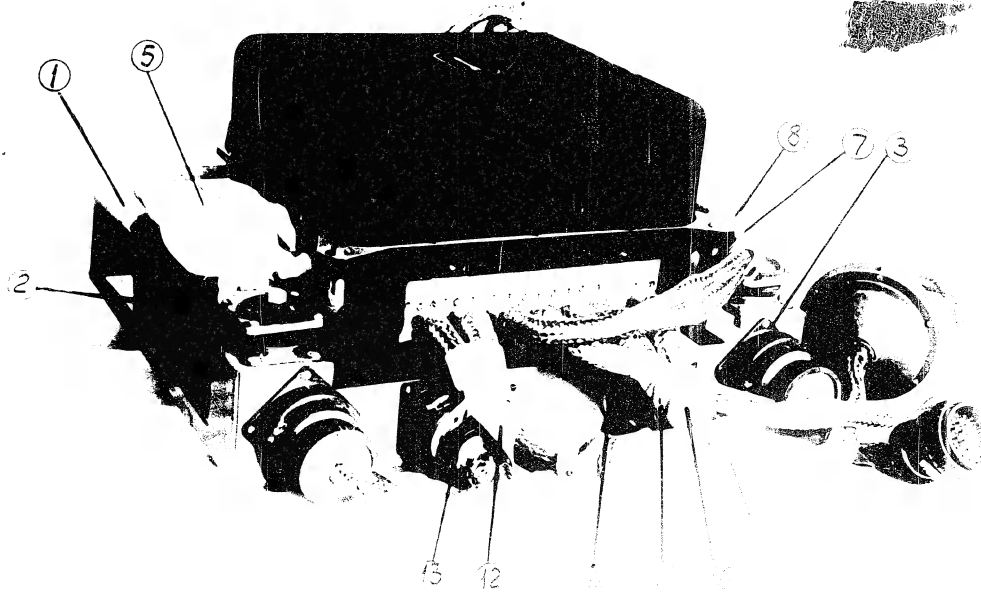


Fig. 3. H-2 Gyro Unit-to-Mounting Attachment

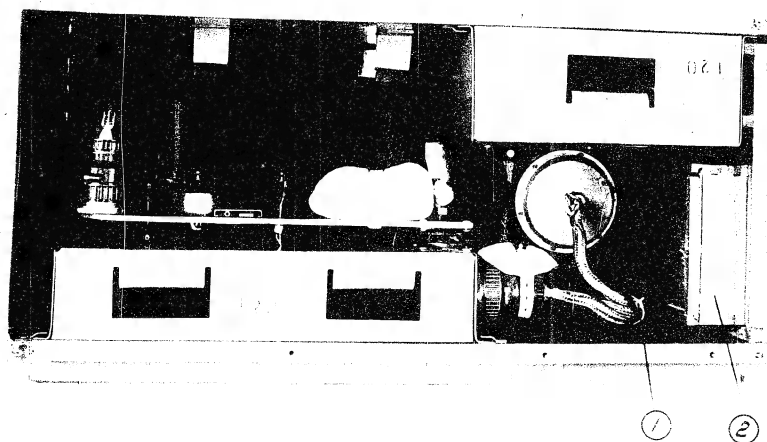


Fig. 4. H-1 and H-2 Units in Tare

Prior to installation, place in each mounting a bag (5, Fig.2 and 3) with "KOH" silica gel dehydrator, 200 gr. (FOCI 3936-47) and in the H-2 gyro unit mounting a bag (6, Fig.3) with blue silica gel indicator, 10-20 gr.

Place the silica gel bags so that they cannot shift during shipment. It is permitted to tie the bags to the cables or mounting with the H-2 gyro unit by brass threads or fasten them by tapes with buttons.

- NOTES:
1. When placing the bags in the cases silica gel dehydrator humidity must not exceed 2%.
 2. The silica gel dehydrator type 4025 can be substituted by silica gel type "KOH" (FOCI 3936-47).
 3. If a cartridge with silica gel - indicator is placed in the case, the bag (5) with silica gel indicator should not be put in the case.
 4. When packing the H-2 gyro unit (manufactured with plug No.42) which is incorporated in the autopilot set installed in the H-2 missile, place in the case the cap for the above mentioned plug; attach the plug to the clamp (6, Fig.2).

On accomplishing the packing, furnish the case with a packing list of a given standard, close the case with the cover, fasten the latter with 14 bolts, secure the case with two seals 1053A55 at the corners located obliquely and mark with an indelible black paint the number of the autopilot set on the right upper corner of the cover and top wall of the case.

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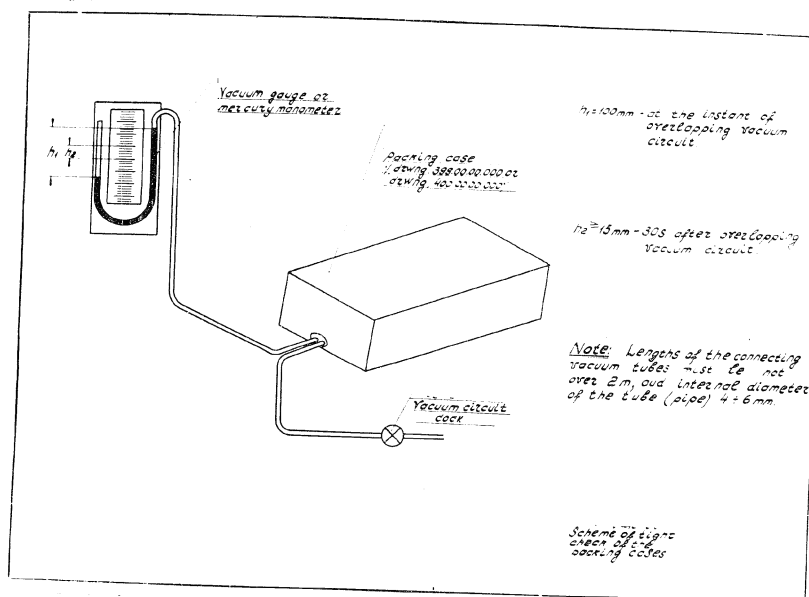


Fig. 9 Testing the Packing Cases for Tightness.

Install the $\Pi-4$ servo units (1) on the mounting (1, Fig. 6) and secure each unit by 4 bolts with nuts.

Coat the $\Pi-4$ servo units output shafts with IR(100) 200-33 lubricant.

Install the $\Pi-1800$ timer on the switch panel (2) and secure it by 4 screws with nuts.

Wrap each plug connector of the $\Pi-4$ servo units and $\Pi-1800$ timer cables with two sheets of oil paper or herringbone tape and tie the tape with linen threads.

Insert the plug connectors in the holders (3). Fasten the $\Pi-4$ servo units to the clamps (4). Secure the cables by the tape with the button (7).

Tighten the HAF-10A inverters (2 ea) to the mounting (1, Fig.7) by the screws with nuts, wrap the end caps and plug connectors of the inverters with two sheets of oil paper (Fig.7) and tie the oil paper with linen threads.

Move the mountings with the H-4 servo units and H-18MO timer and mounting with the HAF-10A inverters into the case using the guide rails (Fig.8).

The mounting should move along the guide rails without shaking and sticking.

If necessary, bend the rails. The mountings must be moved into the case placed on the floor in the vertical position.



Fig. 8. H-4 Servo Units and H-18MO Timer to Mounting Attachment



Fig.7. HAP-IGA Inverter-to-Mounting Attachment

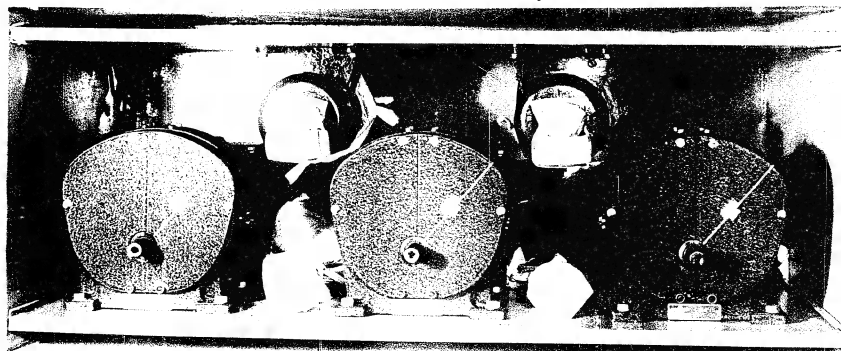


Fig.8. R-1 Servo Units, H-18MO Timer and HAP-IGA Inverters Installed in Rack.

Before installing the mountings, place on the mounting with H-4 servo units and H-18MO timer two bags (5) with "KCM" silica gel dehydrator, 200 grm. each and the bag (6) with a blue silica gel - indicator, 15-20 grm. The bags must be placed so that they are not moved during transportation. It is permitted to tie the bags to the cables with linen threads or secure them by tapes with buttons (Fig.6).

- NOTES:
1. When placing the silica gel dehydrator bags in the tare, silica gel humidity must not exceed 2%.
 2. The silica gel type "KCM" may be substituted by silica gel type "MCM", "HGT" and "LGT".
 3. If a special cartridge with silica gel-indicator is installed in the case, the bag (6) with silica gel-indicator must not be placed in the case.

On accomplishing the packing, furnish the case with the packing list of a given standard, close the case with the cover, attach the case cover with 14 bolts, secure the case with two seals 1053A55 at two corners located obliquely (Fig.1) and mark with an indelible black paint the number of the autopilot set in the right upper corner of the cover and upper wall of the case.

Test the case welded seams tightness and tight fitness of the cover in the same way as for the case with H-1 and H-2 units (see step 3).

NOTE: When packing the autopilot in the using organization it is permitted, as an exception, not to put the silica gel bags in the case and to test the case for airtightness.

2. INSTRUCTIONS FOR PACKING THE AIM-53 AUTOPILOT UNITS IN SHIPPING BOXES

1. To transport the AIM-53 autopilot set or its individual units, the metal cases are additionally placed in the wooden shipping boxes manufactured according to dwg. No.464.00.00.000.

2. When packing the autopilot set in the shipping boxes, proceed as follows:

Open the upper cover of the shipping box. Carefully, without jerks and shocks, place the metal ^{case} in the shipping box so that the case position would correspond to the inscriptions made on the case.

Placed between the walls of the shipping box and metal case are plywood and felt spacers to prevent the metal case from shifting inside the wooden box (Fig.9).

Close the upper cover, secure the box with four iron strips and two seals 1053A55.

On accomplishing the packing, mark with an indelible black paint the number of the autopilot set in the right upper corner of the cover.

NOTE: When packing the H-2 gyro unit incorporated in the autopilot set installed in the "KC" missile, additionally mark on the case cover the number of the "KC" missile in which the H-2 gyro unit is to be installed.

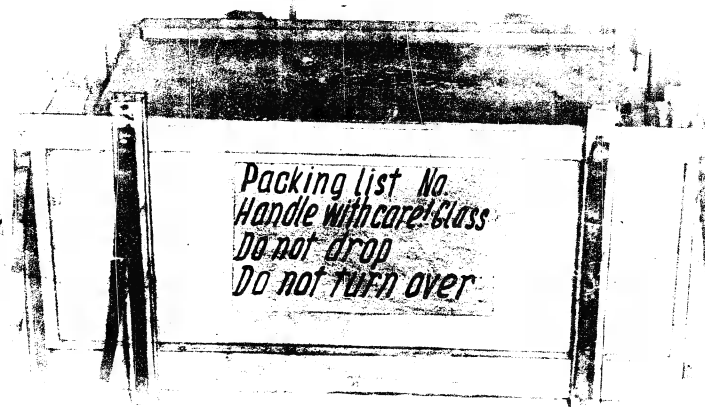


Fig.9. Packing Case in a Shipping Box

3. AN-1B AUTOPILOT UNPACKING INSTRUCTIONS

1. When unpacking the shipping boxes, proceed as follows:

Check for presence of seals on the box. Remove the iron strips and upper cover of the shipping box.

Take out the plywood and felt spacers placed between the wooden box and metal case. Carefully remove the metal case from the wooden box so that the metal case position would correspond to the inscriptions made on the case.

2. Unpack the packing cases with the H-1 and H-2 units as follows:

Check the case for freedom from damages and for presence of seals.

Break the seals and unscrew 14 bolts attaching the ^{wall}~~side~~. Make sure that the packing list is furnished. Check for presence of units and their numbers according to the packing and completing lists.

Inspect the silica gel-indicator. If the silica gel-indicator has become pink, replace the silica gel-indicator and silica gel dehydrator before a repeated packing.

NOTE: The autopilot units stored in the cases with pink silica gel-indicator should not be subjected to special checks; the units serviceability is determined during the next periodic check.

Remove the tape with the button securing cables No.45 and 47 to cable No.44.

Simultaneously take the mountings with the H-I and H-2 units out of the case so that the units would be in the horizontal position.

Disconnect the H-2 gyro unit plug connector No.44 from the flange located on the mounting with the H-I unit and release the H-2 gyro unit filter from the clamp located on the same mounting.

Remove the tapes with the buttons, securing the cables and unscrew the remaining plug connectors of the H-2 gyro unit from the mounting flanges.

Remove the silica gel bags.

Unscrew 3 bolts and remove the H-2 gyro unit from the shock-mounts of the mounting. Move the mounting in the case along the guide rails. Unscrew the screw of the clamp, release the H-I control panel filter and take out the H-I

control panel plug connectors from the holders. Remove the tapes with buttons securing the cables.

Remove the herringbone tape and oil paper from the plug connectors.

Unscrew four screws and remove the H-1 control panel from the mounting shock-mounts. Move the mounting in the case along the guide rails.

Attach the side wall by 2 bolts and place the remaining 12 bolts inside the case.

3. Unpack the cases with the H-1 servo units, H-18MC timer and HAP-12A inverters as follows:

Check the case for freedom from damages and for presence of seals.

Break the seals and unscrew 14 bolts attaching the side wall. Make sure, that the packing list is furnished. Check the units and their numbers according to the packing and completing lists. Inspect the silica gel indicator. If the silica gel has become pink, replace the silica gel-indicator and silica gel-dehydrator before a repeated packing.

NOTE: The autopilot units, stored in the cases with a pink silica gel, should not be subjected to special checks; the units serviceability is determined during the next periodic check.

Remove the mounting with the H-1 servo unit and H-18MC timer so that the units would be in the horizontal position. Remove the silica gel bags.

Unscrew the screws of the clamps, release the H-1 servo unit filters and take out the H-1 servo unit plug connectors from the holders.

Remove the tapes with buttons which secure the cables. Cut the threads, remove the herringbone tape and oil paper from the plug connectors.

Unscrew four screws and remove the H-18M0 timer from the shock-mounts. Unscrew 4 bolts and remove the H-4 servo units from the mounting. Move the mounting into the case along the guide rails.

Take the mounting with the HAF-10A inverters out of the case. Cut the threads and remove oil paper from the end caps and plug connectors of the inverters. Unscrew 4 screws and remove the inverters from the mounting. Move the mounting into the case along the rails.

Attach the side wall by 2 bolts and place the remaining 12 bolts inside the case.

4. ANK-5B AUTOPILOT SHIPMENT

1. The ANK-5B autopilot and its individual units which are not installed in the "KC" winged missile must be shipped in a box according to the requirements indicated in par. 1 and 2, these Instructions.

2. When carrying, loading and shipping the boxes see that the position of the boxes corresponds to the inscriptions made on them. The boxes must be carefully carried and loaded without jerks and shocks.

When shipping, install and attach the boxes so as to protect them from falls, displacement and impacts against each other. Do not transport the autopilot and its individual units

7. The attachment parts must ensure secure attachment of the autopilot units in the missile through out the entire service life. The autopilot units attachment parts and plug connectors must be securely locked.

8. Install and remove the autopilot units only with the electrical system de-energized.

9. The requirements for the autopilot unit installation and removal from the missile are given in the "AG" Ringed Missile Maintenance and Operating Instructions, para 1.

6. CHECKING THE IIR-18 CHECKLIST PRIOR TO PLUG CONNECTION

1. Inspect the packing area. Check the condition of seals and for any damage. Ensure that the packing is in accordance with the instructions given in para. 3. Visually inspect all the units. Check the external surfaces of the units and cables for freedom from damage and traces of corrosion.

When checking the IIR-18 servo units, proceed as follows:

2. Return the IIR-18 servo units to the IIR-18 simulator to its place each IIR-18 unit on its base in the IIR-18 simulator base and secure by the lock.

3. Set the "POWER" switch to the "ON" position in the IIR-18 position.

4. Connect a supply of 24V D.C. to the control panel.

5. Connect the plug connector of the IIR-18 servo units to the control panel by the plug connector.

Set the "PANEL" selector switch in the "II-4" position, "WINDINGS SELECTOR SWITCH" - in the "0" position and "SIGNAL" selector switch in the "60mA" position. Set the "SIGNAL" knob in the "0" position.

4. Switch on the "FEEDBACK" and "POWER" switches. The II-4 servo unit outlet shaft should move to the zero position. Attach the KHA-3 simulator pointer to the outlet shaft, aligning the pointer with the scale zero division. Set the "POWER" switch in the "OFF" position.

Manually turn the servo unit outlet shaft in any direction to the stop. Switch on the "POWER" switch, in this case the II-4 servo unit outlet shaft must move to the zero position to within $\pm 0.25^\circ$; self-oscillations should not appear. Repeat the check with the servo unit outlet shaft turned in the opposite direction.

5. Set the "FEEDBACK" switch in the "OFF" position, the "WINDING SELECTOR SWITCH" - in the "I" position and the "SIGNAL" selector switch in the "3mA" position (for the KH-I control panels, whose "SIGNAL" milliammeter has the scales of "3-0-3mA", "60-0-70mA"). Smoothly turn the "SIGNAL" knob to the right, increase the control signal till the servo unit outlet shaft starts steadily rotating and moves to the limit switch (turning through an angle of $10-11^\circ$ from the zero position).

The control signal value (in mA) is the unit sensitivity.

When using the KH-I control panel whose "SIGNAL" milliammeter has the scales of "1-0-1mA", "1.5-0-1.5 mA", "2.5-0-2.5mA" and "60-0-60mA", check as described above except for the position of the "SIGNAL" selector switch which must be set before the check in the "1mA" position. If, when turning the "SIGNAL" knob, the

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Set the "PANEL" selector switch in the "I" position, "WINDINGS SELECTOR SWITCH" - in the "0" position and "SIGNAL" selector switch in the "60mA" position. Set the "SIGNAL" knob in the "0" position.

4. Switch on the "POWER" and "WINDINGS" switches. The H-4 servo unit outlet shaft should move to the zero position. Attach the H-4 indicator pointer to the outlet shaft, aligning the pointer with the scale zero division. Set the "POWER" switch in the "OFF" position.

Manually turn the servo unit outlet shaft to any position to the stop. Switch on the "WINDINGS" switch. The H-4 servo unit outlet shaft must move to the zero position to within $\pm 0.25^\circ$. Self-oscillation should not be observed. Check with the servo unit outlet shaft moving in the opposite direction.

5. Set the "WINDINGS" switch in the "1" position. The "WINDINGS" switch is located on the control panel, where "WINDINGS" selector switch is located. The control panel, where "WINDINGS" selector switch is located, has scales of "3-0.3mA", "60-0-60mA", "11.5-0-11.5 mA", "22.5-0-22.5 mA" and "60-0-60mA". When the "WINDINGS" switch is in the "1" position, increase the control signal value to the right, the outlet shaft starts steadily rotating in the direction of the scale (turning through an angle of 180° from the zero position).

The control signal value must be well regulated.

When using the H-4 control panel where "WINDINGS" selector switch has the scales of "11.5-0-11.5 mA", "22.5-0-22.5 mA" and "60-0-60mA", check as described above except for the position of the "SIGNAL" selector switch which must be set before the check in the "1mA" position. If, when turning the "SIGNAL" knob, the

Set the "PANEL" selector switch in the "0" position, "WINDINGS SELECTOR SWITCH" - in the "0" position and "SIGNAL" selector switch in the "0.0mA" position. Set the "VARIABLE" knob in the "0" position.

4. Switch on the "POWER" and "WINDINGS" switches. The H-4 servo unit outlet shaft should move to the zero position. Attach the H-4 indicator pointer to the outlet shaft, aligning the pointer with the scale zero direction, set the "POWER" switch in the "OFF" position.

Manually turn the servo unit outlet shaft in any direction to the stop. Switch on the "WINDINGS" switch.

H-4 servo unit outlet shaft must move to the zero position to within $\pm 0.2^\circ$; self-oscillations should not be observed. The check with the servo unit outlet shaft turning in the opposite direction.

5. Set the "PANEL" selector switch in the "0" position, "WINDINGS SELECTOR SWITCH" - in the "0" position, and the "SIGNAL" selector switch in the "0.0mA" position. On the control panels, whose "WINDINGS" characteristic is the reading of "3-0.3mA", "0-0-70mA", proceed as follows: turn the knob to the right, increase the control signal to the limit, the outlet shaft starts steadily rotating clockwise (turning through an angle of 180° and back to the starting position).

The control signal value is indicated on the scale of the "WINDINGS" selector switch.

When setting the "WINDINGS" selector switch to the "0" position, the outlet shaft must move to the zero position. The control signal value is indicated on the scale of the "WINDINGS" selector switch. When setting the "WINDINGS" selector switch to the "0" position, the outlet shaft must move to the zero position. The control signal value is indicated on the scale of the "WINDINGS" selector switch. When setting the "WINDINGS" selector switch to the "0" position, the outlet shaft must move to the zero position. The control signal value is indicated on the scale of the "WINDINGS" selector switch.

Set the "RANGE" selector switch in the "0" position, the "WINDING SWITCH" in the "0" position and the "SIGNAL" selector switch in the "0" position. Set the "RANGE" knob in the "0" position.

4. Switch on the "POWER" and "WINDING" switches. The H-4 servo unit outlet shaft starts to move in the zero position. Attach the H-4 simulator pointer to the outlet shaft, aligning the pointer with the scale zero position. Set the "POWER" switch in the "STOP" position.

Manually turn the servo unit outlet shaft slowly in relation to the stop. Switch on the "POWER" switch. The servo unit H-4 servo unit outlet shaft must move in the zero position to within $\pm 1.25^\circ$; self-oscillations are not allowed. Check the check with the servo unit outlet shaft turned in the opposite direction.

5. Set the "RANGE" selector switch in the "0" position, the "WINDING SWITCH" in the "0" position and the "SIGNAL" selector switch in the "0" position. Set the "H-4" control panels, whose "SIGNAL" indicator has the scales of "3-0.3mA", "10-0-70mA". Control. Turn the "SIGNAL" knob to the right, increase the control signal until the servo unit outlet shaft starts steadily rotating and moves to the limit switch (turning through an angle of 45° from the zero position).

The control signal value (in mA) is the self-oscillation.

Then using the H-4 control panel whose "SIGNAL" indicator has the scales of "1-1mA", "1.5-0-1.5mA", "2.5-0-2.5mA" and "60-0-60mA", check as described above for the position of the "SIGNAL" selector switch which must be set before the check in the "1mA" position. If, when turning the "SIGNAL" knob, the

control signal value, at which the shaft starts rotating, exceeds 1mA, it is necessary to set the "SIGNAL" selector switch in the "1.5mA" position and if these values are exceeded, set the selector switch in the "2.5mA" position.

Repeat checking with the "SIGNAL" knob turned to the left.

The servo unit outlet shaft should move to the opposite limit switch.

When setting, in turn, the SENSITIVITY switch in the positions "1", "2" and "3" check the servo unit sensitivity with the other windings. With the SENSITIVITY OR SWITCH in the "1", "2" and "3" positions, the servo unit sensitivity must be 0.9-1.35 mA. per 1° of deflection - 0.92-1.35 mA.

6. Switch on the REVERSE switch, set the REVERSE selector switch in the "REV" position. REVERSE SELECTOR SWITCH - in the "REV" position.

Gradually increase the control signal to 1.5mA, turn the "SIGNAL" knob to the stop. The outlet shaft must move smoothly without jerks.

Repeat the check when setting the signal to 2.5mA sensitivity. Set the REVERSE switch in the "REV" position. Disconnect the H-1 servo unit plug, connector from the control panel.

7. Check the other two H-1 units connected to the autopilot set in the similar way.

Check the H-1-1A INTERLOCK switch.

8. Set the "1.5mA" and "2.5mA" switches of the REVERSE control panel in the "CVP" position and the REVERSE OR SWITCH in the "CVP" position.

Connect ^a supply of 26 V A.C. to the control panel.

Connect the control panel cable to the plug connector of one of the HAI-1BA inverters.

9. Switch on the "POWER" and "IOAP" switches.

The gyro motors installed in the control panel must start rotating. After 3 min. check by the control panel A.C. ammeter the current drawn by the inverter which under normal conditions must not exceed 3.5 A.

When checking the autopilot at a temperature different from the normal temperature within a range of -35°C to $+50^{\circ}\text{C}$, increase the above mentioned tolerance by 0.06A for each 10°C of the temperature change either side from normal.

10. Set the "PHASE SELECTION SWITCH" in the "1" position. Check A.C. voltage generated by the inverter using the control panel A.C. voltmeter and the alternating current generated by the inverter using the control panel A.C. ammeter. Under normal conditions voltage should be equal to 36 ± 4 V and current should not exceed 0.5 A.

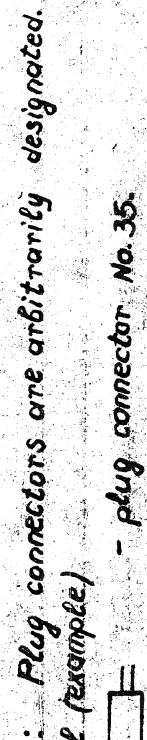
When checking at a temperature different from the normal temperature within a range of -35° to $+50^{\circ}\text{C}$, increase the 4 V tolerance of the voltmeter readings by 0.2 V for every 10°C of the temperature change either side from normal.

In the temperature range indicated below and other similar conditions the tolerance for the ammeter, must be increased:

at $T = +20$ to -35°C by 0.051 A

at $T = +20$ to $+50^{\circ}\text{C}$ by 0.012 A.

Set the "PHASE SELECTION SWITCH" in the "2" and "3" positions and check voltage and current in two other phases of the inverter.

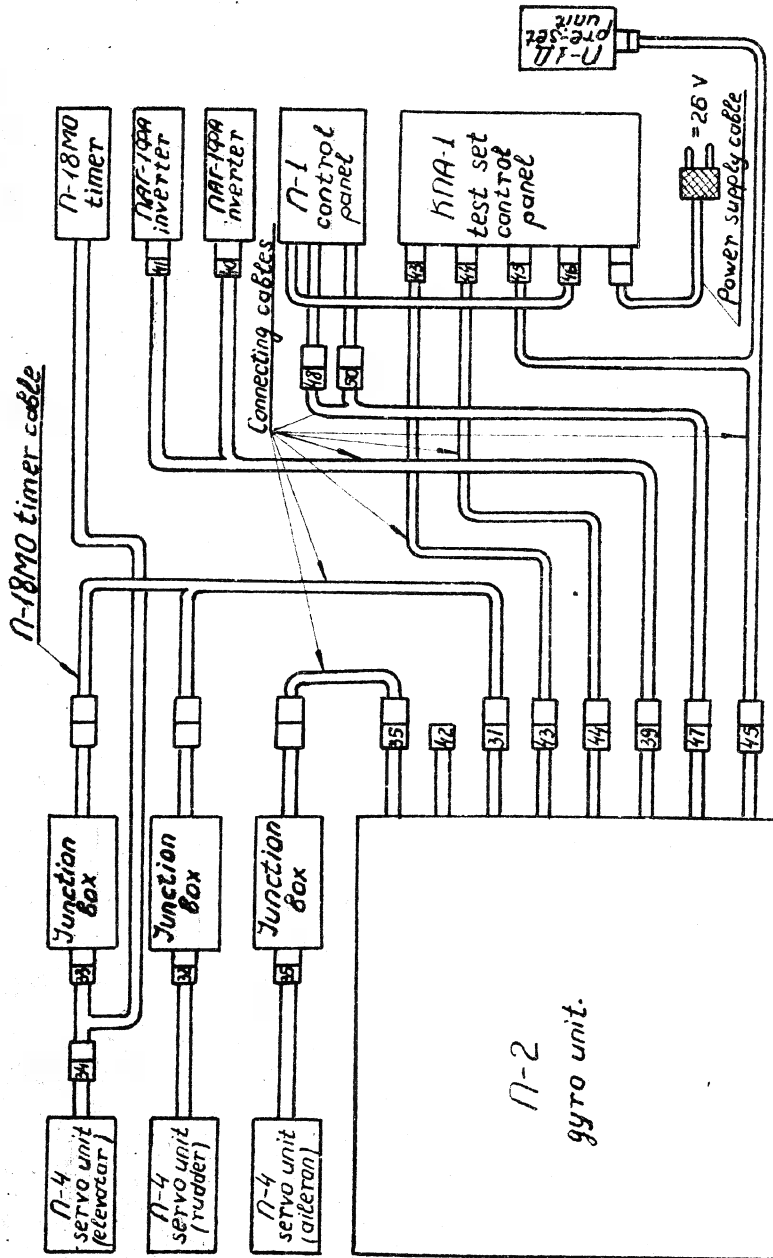


\therefore Plug connectors are arbitrarily designated.

- plug connector No. 35.

secret

ent No. 12 to ANK-5B outopilot specifications



NOTE: Plug connectors are arbitrarily designated.

Symbol (example)

35

- plug connector No. 35.

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FIG. 10. Block diagram of AUG-5B autopilot unit's connection with Test Set.

Attach the KMA-3 simulator pointers to the E-4 servo unit outlet shafts and set the pointers at zero points on the simulator scales.

NOTES: a) Before energizing the autopilot, check the "CENTERING" potentiometer wipers position on the E-1 control panel; in this case the slot on the potentiometer shaft must be against the index on the panel cover.

b) After illumination of the "ARMED" warning lights but not earlier than 3 min. after power is applied, set the selector switch on the E-1 panel in the "RIGHT" position. Set the "ELEV-3" knob of the E-1 panel in the 1 deg. "UP" position, the milliammeter pointer on the E-1 panel must deflect "UP", approx. one division. Press the "ARMING" button on the KMA-1 control panel, the "ARMED" warning light must go out and the "UNARMED" warning light must come on, the elevator simulator pointer must deflect 1° 42' to the left. Turn the "ELEV-3" knob of the E-1 panel in turn to the left and to the right. The pointers of the elevator simulator and milliammeter on the E-1 panel must be motionless. Set the "ELEV-3" knob on the E-1 panel in the zero position and change the selector switch from the "RIGHT" position to the middle position.

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cut off power supply on the HI-4 control panel and after 5-10 sec. energize the autopilot again. Wait, until the "BURNING" warning light comes on.

- c) After the "BURNING" warning light is illuminated, repeat the check according to step 1 with the pre-set unit knob on HI-4 panel set in the 1°, 4°, 7° and 10° position. In this case the control surface simulator must maintain its within $\pm 30\%$ of the value indicated by the pre-set unit on the HI-4 panel.

Repeat the check for each of the pre-set unit knob set down in the 1°, 4°, 7°, 10° and 13° positions, in each case the simulator must maintain its within $\pm 30\%$ of the value indicated by the pre-set unit on the HI-4 panel. The control surface simulator must dev. less than 10% right (as viewed from the servo unit end) and left.

NOTE:

1. When turning the HI-4 panel pre-set unit knob to the left or to the right in the range of 0° to 2°, the "BURNING" warning light may remain illuminated.

2. When switching over to the A-17E

the 115 power supply on the 115-1 control panel and after 5-10 sec. energize the autopilot again. Wait, until the "BASES" warning light comes on.

- c) When the "BASES" warning light is illuminated, repeat the check according to step "a" with the pre-set unit knob on the 115-1 panel set in the 2°, 4°, 5° and 6° position. In this case the control surface deflection must be within $\pm 3\%$ of the value indicated by the pre-set unit of the 115-1 panel.
- d) Repeat the check with the 115-1 panel pre-set unit knob set down in the 1°, 2°, 3°, 4°, 5° and 6° positions, in this case the flap deflector on the 115-1 panel must move down and the control surface simulator must def. down to the right (as viewed from the servo unit side, and).

- 115-1. When turning the 115-1 panel pre-set unit knob to the left or to the right in the range of 0° to 2°, the "BASES" warning light may remain illuminated.

2. When switching over to the 115-17K

simulator, the direction indicator on the AAA panel is inoperative.

15. After the "Warning Lights" warning lights come on (but not earlier than 5 min. after power is supplied) set the "POWER SELECTOR SWITCH" on the control panel in the "BOARD CHARGE" position and switch on the "CHARGE" switch.

The "BOARD CHARGE" and "CHARGE" warning lights must come on. Sharply deflect the H-3 gyro unit in direction; at the instant of turning the H-3 gyro unit, the H-1 rudder servo unit outlet shaft must turn. Repeat the check when turning the H-3 unit in the opposite direction.

Perform similar checks when turning the H-2 gyro unit in each and both.

16. Direction of the H-3 servo unit starts rotation must correspond to Table No.1. The pointers of the control panel position indicators, when the H-2 gyro unit is turned in the directions indicated in Table No.1, must move to the left.

Table No.1.

| Channel | Direction of H-3 gyro unit turn | Direction of outlet shafts rotation | | |
|-----------|---------------------------------|-------------------------------------|-------------------------|------------------------|
| | | H-3 rudder servo unit | H-4 elevator servo unit | H-5 aileron servo unit |
| Direction | to the right | counter-clockwise | - | - |
| Pitch | up | - | clockwise | - |
| Roll | to the right | - | - | clockwise |

NOTE: after the H-3 gyro unit is stopped, the H-4 servo unit outlet shafts must return to the zero position to within $\pm 0.25^\circ$.

15. Fully turn the "RUDDER" knob on the control panel to the "RIGHT". The H-4 rudder servo unit outlet shaft must smoothly, without jerks, turn clockwise and the H-4 aileron servo unit outlet shaft - counterclockwise. Fully turn the "RUDDER" knob to the "LEFT". The H-4 rudder servo unit outlet shaft must smoothly, without jerks, turn counterclockwise and the H-4 aileron servo unit outlet shaft - clockwise. Set the "RUDDER" knob in the zero position.

Fully turn the "ELEVATOR" knob on the control panel to the "UP" position.

The H-4 elevator servo unit outlet shaft must smoothly, without jerks, turn counterclockwise. Fully turn the "ELEVATOR" knob to the "DOWN" position. The H-4 elevator servo unit shaft must smoothly, without jerks, turn clockwise. Set the "ELEVATOR" knob in the zero position and the "CLACK" switch in the "UP" position. Wait till the H-4 servo units outlet shafts move to the zero position and "HAUSE ZERO" warning lights come on.

17. Set the "FEEDBACK SWITCH" in the "HK-17M SIMULATOR" position. The "HK-17M SIMULATOR" warning light must become illuminated. Press the "UNCOUPLING" button on the control panel and simultaneously start the stop-watch; in this case the "CALIB" warning light must go out and "UNCOUPL" warning light must come on. 2-3 sec. after the "UNCOUPLING" button is pressed, the H-4 elevator servo unit outlet shaft must turn counterclockwise through an angle of $9-9.5^{\circ}$ and 40-42 sec. after the button is pressed, the outlet shaft must return to the zero position to within $\pm 0.55^{\circ}$. Perform the check twice. When uncoupling for the first time, check the H-4 servo

power of 28.6 V D.C. to the control panel. Set the "PANEL" selector switch in the "H-4" position, the "WINDING SELECTOR SWITCH" - in the "0" position and the "SIGNAL" selector switch - in the "COM" position. Set the "SIGNAL" knob in the "0" position.

3. Switch on the "POWER" and "FEEDBACK" switches, in this case the H-4 aileron servo unit shaft must turn to the zero position.

Check the ailerons position. If the ailerons are deflected from the neutral position (i.e. the ailerons neutral position does not correspond to the zero position of the H-4 servo unit) set the ailerons in the neutral position by changing the rod length using the adjustment elements.

4. Set the "FEEDBACK" switch in the "OFF" position and "WINDING SELECTOR SWITCH" - in the "I" position. Slowly rotating the "SIGNAL" potentiometer knob, first in one and then in the other side of zero position, determine the ailerons maximum angle of deflection (till the H-4 servo unit limit switches are actuated) which must be within ± 9.5 to 11.5° from the neutral position.

5. Set the "SIGNAL" knob in the "0" position, switch on the "FEEDBACK" switch and check that the ailerons are set in the neutral position again; in this case permissible angle of the ailerons deflection from the neutral position is up to 0.25° .

6. Set the "POWER" switch in the "OFF" position and manually deflect the ailerons in either side to the stop; then switch on the "POWER" switch, in this case the ailerons

must move to the neutral position and self-oscillation must not occur.

Repeat the check with the ailerons deflected to the opposite side. Set the "POWER" switch in the "OFF" position and disconnect the H-4 aileron servo unit plug connector from the control panel.

7. Check the H-4 rudder and elevator servo units for proper installation (steps 2-6).

NOTE: The elevator neutral position is the deflection through $2.5-3^{\circ}$ up from the geometric neutral position. Further, this position of the elevator is called "ZERO" position.

8. TESTING THE ANK-5B AUTOPILOT AFTER INSTALLATION IN THE "KC" MISSILE

1. To check the ANK-5B autopilot after installing it in the "KC" missile, remove the H-2 gyro unit from the missile irrespective of the preservation to which the given "KC" missile will be subjected after it is accepted by the Customer.

2. Install the H-2 gyro unit on the KIA-5 turn table according to the instructions given in step 12, par. 6.

NOTE: It is permitted to install the H-2 gyro unit on the KIA-5 turn table without removing the gyro unit from the mounting.

3. Place the H-2 gyro unit secured to the turn table at a distance of 1-2.5 m. from the access door in the fuselage bottom section between frames 14 and 18.

NOTE: When installing the turn table see that it does not slide on the base.

4. Connect the II-2 gyro unit plug connectors observing the numbers on the plug connectors and the autopilot wiring diagram (Fig.11), in this case:

a) connect the II-2 gyro unit receptacles No.31, 35, 39, 43 and 47 to the mating plugs of the missile wiring system through the connecting cables;

b) connect the II-2 gyro unit receptacle No.4 to the mating plug of the UIA-1 control panel through the connecting cable; the UIA-1 control panel plug connector No.43 through the connecting cable - to plug connector No.36 used for checking the autopilot installed in the missile and the II-2 gyro unit plug connector No.45 - to the UIA-1 and UI-3 control panels through the connecting cable according to the block diagram given in Fig.10.

NOTES:

1. Do not connect plug connectors when the system is energized.
2. Connect the autopilot to the missile energized electrical system to check it only after the missile wiring system is approved by the Missile Inspection Department and by the Missile Test Department. When checking the autopilot operation, proceed as follows:

a) Supply power of 28 ± 0.5 V d.c. to the missile electrical system switch on the "POWER" switch on the control panel. In this case the "Halt" indicator light and the "CAUTION" warning lights and (no later than 40 sec) the "EARTH" warning light come on. Do not touch the "Halt" indicator light.

The rudder and ailerons must be set in the neutral positions to within $\pm 0.5^\circ$ and the elevator must be set $2.5-3^\circ$ Up from the geometric neutral position (further, this position of the elevator is called a "ZERO" position). The control surfaces position indicators pointers must be in the middle positions.

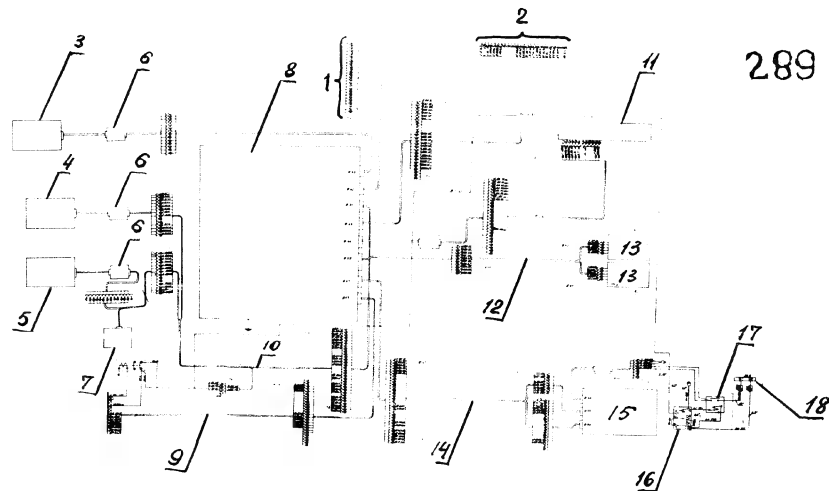
a) After the "BASES ZERO" warning lights become illuminated, but not earlier than 3 min. after power is supplied, set the "B" selector switch on the III-A control panel in the "TO THE RIGHT" position. Set the pre-set unit knob on the III-A control panel in the position 4 divisions down. The pointer of the millimeter on the III-A panel must deflect down approx. 4 divisions. The "BASES ZERO" warning light on the KHA-1 control panel must go out. Press the "UNCAGING" button; the elevator must move through an angle of $4^\circ \pm 1^\circ 24'$ down from the initial position.

Turn the pre-set unit knob on the III-A control panel "UP", "DOWN" and then set it in the zero position.

The elevator must be motionless. Set the selector switch on the III-A control panel in the middle position.

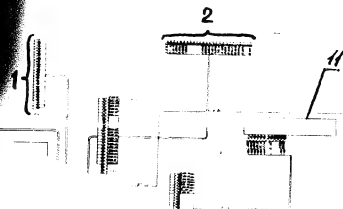
De-energize the autopilot. Repeat the check with the pre-set unit knob set in the 3° and 6° positions.

b) Repeat the check as specified in step "a" with the pre-set unit knob set 4° "UP". In this case the elevator must move through an angle of $4^\circ \pm 1^\circ 24'$ up.



- to TKC System
see dwg. KC-7406-10
- 2) Test plug connector WIP48NK243W2
 - 3) П-4 servo unit (ailerons)
 - 4) П-4 servo unit (rudder)
 - 5) П-4 servo unit (elevator)
 - 6) Filter
 - 7) П-18M0 timer
 - 8) П-2 gyro unit
 - 9) Cable No. 9
 - 10) Cable No. 1
 - 11) K-1-13M unit
 - 12) Cable No. 3
 - 13) ПAF-1ΦA inverter
 - 14) Cable No. 2
 - 15) П-1 control panel
 - 16) ПН-2 relay
 - 17) K-20A contactor
 - 18) Junction box (see dwg. 7201-00)

FIG. 14. KC-7406-10 Autopilot wiring diagram



- 1) Cable N. 11/4
to TKC System
see dwg. KC-7406-10
- 2) Test plug connector WIP48AK243W2
- 3) 11-4 servo unit (ailerons)
- 4) 11-4 servo unit (rudder)
- 5) 11-4 servo unit (elevator)
- 6) Filter
- 7) 11-18M0 timer
- 8) 11-2 gyro unit
- 9) Cable No. 9
- 10) Cable No. 1
- 11) K-1-13M unit
- 12) Cable No. 3
- 13) 11A1-10A inverter
- 14) Cable No. 2
- 15) 11-1 control panel
- 16) 211-2 relay
- 17) K-20A contactor
- 18) Junction box (see dwg. 7201-00)

Fig. 11. KC-7406 Autopilot wiring diagram

4. If two stop-watches are available check the programmed operation at a single switching-on of the H-18M timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the H-2 gyro unit through an angle of $\pm 45^\circ$ in yaw, $\pm 25^\circ$ in pitch and $\pm 40^\circ$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the H-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the auto-pilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the H-2 unit in pitch within $\pm 25^\circ$.

Table No.4

| Channel | Direction of H-2 gyro unit turn | Direction of deflection | | |
|-----------|---------------------------------|-------------------------|----------|--------------------|
| | | Rudder | Elevator | Ailerons |
| Direction | to the right | to the left | - | right aileron down |
| Pitch | up | - | down | - |
| Roll | to the right | - | - | right aileron down |

4. If two stop-watches are available check the programmed operation at a single switching-on of the H-18MO timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the H-3 gyro unit through an angle of $\pm 45^\circ$ in yaw, $\pm 25^\circ$ in pitch and $\pm 40^\circ$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the H-3 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 40° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the H-3 unit in pitch within $\pm 25^\circ$.

Table No.4

| Channel | Direction of gyro unit turn | Direction of deflection | | |
|-----------|-----------------------------|-------------------------|----------|--------------------|
| | | Rudder | Elevator | Ailerons |
| Direction | to the right | to the left | - | right aileron down |
| Pitch | up | - | down | - |
| Roll | to the right | - | - | right aileron down |

4. If two stop-watches are available check the programmed operation at a single switching-on of the H-18MO timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the H-2 gyro unit through an angle of $\pm 45^\circ$ in yaw, $\pm 25^\circ$ in pitch and $\pm 40^\circ$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the H-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the H-2 unit in pitch within $\pm 25^\circ$.

Table No.4

| Channel | Direction of gyro unit turn | Direction of deflection | | |
|-----------|-----------------------------|-------------------------|----------|--------------------|
| | | Rudder | Elevator | Ailerons |
| Direction | to the right | to the left | - | right aileron down |
| Pitch | up | - | down | - |
| Roll | to the right | - | - | right aileron down |

4. If two stop-watches are available check the programmed operation at a single switching-on of the H-18MO timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the H-2 gyro unit through an angle of $\pm 45^\circ$ in yaw, $\pm 25^\circ$ in pitch and $\pm 40^\circ$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the H-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is unchanged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the H-2 unit in pitch within $\pm 25^\circ$.

Table No.4

| Channel | Direction of gyro unit turn | Direction of deflection | | |
|-----------|-----------------------------|-------------------------|----------|--------------------|
| | | Rudder | Elevator | Ailerons |
| Direction | to the right | to the left | - | right aileron down |
| Pitch | up | - | down | - |
| Roll | to the right | - | - | right aileron down |

4. If two stop-watches are available check the programmed operation at a single switching-on of the H-18MO timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the H-2 gyro unit through an angle of $\pm 45^\circ$ in yaw, $\pm 25^\circ$ in pitch and $\pm 40^\circ$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the H-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the auto-pilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the H-2 unit in pitch within $\pm 25^\circ$.

Table No.4

| Channel | Direction of H-2 gyro unit turn | Direction of deflection | | |
|-----------|---------------------------------|-------------------------|----------|--------------------|
| | | Rudder | Elevator | Ailerons |
| Direction | to the right | to the left | - | right aileron down |
| Pitch | up | - | down | - |
| Roll | to the right | - | - | right aileron down |

4. If two stop-watches are available check the programmed operation at a single switching-on of the H-18MO timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the H-2 gyro unit through an angle of $\pm 45^\circ$ in yaw, $\pm 25^\circ$ in pitch and $\pm 40^\circ$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the H-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the H-2 unit in pitch within $\pm 25^\circ$.

Table No.4

| Channel | Direction of gyro unit turn | Direction of deflection | | |
|-----------|-----------------------------|-------------------------|----------|--------------------|
| | | Rudder | Elevator | Ailerons |
| Direction | to the right | to the left | - | right aileron down |
| Pitch | up | - | down | - |
| Roll | to the right | - | - | right aileron down |

4. If two stop-watches are available check the programmed operation at a single switching-on of the H-18MO timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the H-2 gyro unit through an angle of $\pm 45^\circ$ in yaw, $\pm 25^\circ$ in pitch and $\pm 40^\circ$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No. 4.

When stopping the H-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the H-2 unit in pitch within $\pm 25^\circ$.

Table No. 4

| Channel | Direction of gyro unit turn | Direction of deflection | | |
|-----------|-----------------------------|-------------------------|----------|--------------------|
| | | Rudder | Elevator | Ailerons |
| Direction | to the right | to the left | - | right aileron down |
| Pitch | up | - | down | - |
| Roll | to the right | - | - | right aileron down |

4. If two stop-watches are available check the programmed operation at a single switching-on of the IL-18MO timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the IL-2 gyro unit through an angle of $\pm 45^\circ$ in yaw, $\pm 25^\circ$ in pitch and $\pm 40^\circ$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the IL-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the IL-2 unit in pitch within $\pm 25^\circ$.

Table No.4

| Channel | Direction of gyro unit turn | Direction of deflection | | |
|-----------|-----------------------------|-------------------------|----------|--------------------|
| | | Rudder | Elevator | Ailerons |
| Direction | to the right | to the left | - | right aileron down |
| Pitch | up | - | down | - |
| Roll | to the right | - | - | right aileron down |

10. Set the "CHECK COMMANDS" switch in the "2-14 SIMULATION" position. The "2-14 SIMULATION" warning light must come on.

Switch on the "COMMAND No.1" switch on the control panel. The "COMMAND No.1" warning light must become illuminated. When command No.1 is sent, the control surfaces may deflect from the position, occupied by them before the command is sent, through the angles within $\pm 1.6^\circ$ (elevator and ailerons) and $\pm 0.3^\circ$ (rudder).

Fully turn the "RUDDER" knob on the control panel to the "RIGHT". The rudder must smoothly, without jerks, deflect to the right and the right aileron - up. Set the "RUDDER" knob in the zero position; in this case the rudder and ailerons must move to the neutral position.

Repeat the check with the "RUDDER" knob turned to the "LEFT".

Fully turn the "ELEVATOR" knob on the control panel to the "UP". The elevator must smoothly, without jerks, deflect upwards. Set the "ELEVATOR" knob in the zero position; in this case the elevator must move to the zero position. Repeat the check with the "ELEVATOR" knob turned to the "DOWN" position.

NOTE: The time, required for sending a signal of one polarity, should not exceed 15 sec.

11. Switch on the "COMMAND No.2" switch on the control panel. The "COMMAND No.2" warning light must become illuminated. Check how the control surfaces are controlled by the "RUDDER" and "ELEVATOR" pre-set units on the control panel in the same manner as when sending command No.1; in this case, when setting the "RUDDER" and "ELEVATOR" knobs in the zero positions, the control surfaces must get move to the neutral position.

12. Set the "COMMAND No.1" and "COMMAND No.2" switches in the "OFF" position and the "POWER SELECTION SWITCH" on the control panel - in the "GYRO-UNIT" position. Set the "POWER" switch of the [] control unit in the "OFF" position and if the autopilot has operated for more than 60 min. make an interval for not less than 30 min. to cool the [] gyro unit.

13. Switch on the [] control unit "POWER" switch. After the "BASIC SERVO" warning light comes on (but not earlier than 3 min. after power is supplied) press the "UNCAGING" button on the control panel.

The "CAUTION" warning light must go out and the "UNCAGING" warning light must come on.

After 5 min., check the autopilot free gyro precession. The gyro rigidity should be so, that the control surfaces deflection from the neutral position for 5 min. would not exceed:

rudder $\pm 1.25^\circ$
 elevator $\pm 2.5^\circ$
 ailerons $\pm 1.25^\circ$.

When checking the gyro rigidity, the [] gyro unit must be in the horizontal position.

NOTE: The ailerons deflection depends also on the yaw free gyro precession (due to a signal picked up from the coordination potentiometer): therefore before determining the value of the roll free gyro precession, set the rudder in the neutral position by turning the [] gyro unit in yaw. In this case the ailerons deflection from the neutral position corresponds to the roll gyro precession.

14. Set the "POWER" switch on the H-1 control panel in the "OFF" position. Disconnect the H-2 gyro unit plug connectors and remove the unit from the turn table.

15. Make entries about the autopilot checks performed in the "KC" missile Log-Book.

16. Install the H-2 unit in the missile and check the autopilot operation as follows (steps 17-24).

17. Connect plug connector No.36 of the ground test panel to the autopilot board check plug connector No.36 via the connecting cable, control panel plug connector No.12 through the connecting cable to plug connector No.12 of the missile wiring system having disconnected this plug connector from the H-1-13W unit and connect plug connector No.45 through the control panel connecting cable to plug connector No.45 of the H-2 gyro unit having disconnected it from the missile electrical system.

Switch off all the switches on the control panel, supply power of 28 ± 0.5 V d.c. to the missile electrical system and 26 volts to the "+" terminal of the control panel.

18. Switch on the "POWER" switch on the H-1 control unit. The H-1-13A inverters must start operating. The "CAGED" and "BASES ZERO" warning lights on the control panel must become illuminated.

The control surfaces should be set in the neutral position. The indicator pointers on the control panel must be in the middle positions.

19. Switch on the "POWER" and "CHECK" switches on the control panel. Turn the "H-2" switch on the control panel.

14. Set the "POWER" switch on the H-1 control panel in the "OFF" position. Disconnect the H-2 gyro unit plug connectors and remove the unit from the turn table.

15. Make entries about the autopilot checks performed in the "KC" missile Log-Book.

16. Install the H-2 unit in the missile and check the autopilot operation as follows (steps 17-24).

17. Connect plug connector No.36 of the ground test panel to the autopilot board check plug connector No.36 via the connecting cable, control panel plug connector No.12 through the connecting cable to plug connector No.12 of the missile wiring system having disconnected this plug connector from the K1-12M unit and connect plug connector No.45 through the control panel connecting cable to plug connector No.45 of the H-2 gyro unit having disconnected it from the missile electrical system.

Switch off all the switches on the control panel, supply power of 28 ± 0.5 V d.c. to the missile electrical system and 26 volts to the "+" terminal of the control panel.

18. Switch on the "POWER" switch on the H-1 control unit. The HAI-1A inverters must start operating. The "CAGED" and "BASES ZERO" warning lights on the control panel must become illuminated.

The control surfaces should be set in the neutral position.

The indicator pointers on the control panel must be in the middle positions.

19. Switch on the "POWER" and "CHECK" switches on the control panel. Turn the "RUDDER" knob on the control panel.

14. Set the "POWER" switch on the J-1 control panel in the "OFF" position. Disconnect the J-1 gyro unit plug, connectors and remove the unit from the turn table.

15. Make entries about the autopilot checks performed in the "KC" missile log-Book.

16. Install the J-1 unit in the missile and check the autopilot operation as follows (steps 17-24).

17. Connect plug connector No.36 of the ground test panel to the autopilot board check plug connector No.36 via the connecting cable, control panel plug connector No.12 through the connecting cable to plug connector No.12 of the missile wiring system having disconnected this plug connector from the K1-13M unit and connect plug connector No.45 through the control panel connecting cable to plug connector No.45 of the J-1 gyro unit having disconnected it from the missile electrical system.

Switch off all the switches on the control panel, supply power of 28 ± 0.5 V d.c. to the missile electrical system and 26 volts to the "+" terminal of the control panel.

18. Switch on the "POWER" switch on the J-1 control unit. The HAP-1A inverters must start operating. The "CAGE" and "BASES ZERO" warning lights on the control panel must become illuminated.

The control surfaces should be set in the neutral position.

The indicator pointers on the control panel must be in the middle positions.

19. Switch on the "POWER" and "CHECK" switches on the control panel. Turn the "RUDDER" knob on the control panel.

The rudder and ailerons must deflect. Turn the "RUDDER" knob in the opposite direction. The rudder and ailerons must move in the opposite direction. Set the "RUDDER" knob in the zero position. Turn the "ELEVATOR" knob on the control panel. The elevator must deflect. Turn the "ELEVATOR" knob in the opposite direction. The elevator must deflect in the opposite direction. Set the "ELEVATOR" knob in the zero position.

Set the "CHECK" switch in the "OFF" position. Wait, till the control surfaces move to the neutral position and the "RISER ZERO" warning light comes on.

20. Press the "UNARMED" button on the control panel. The "CAUTION" warning light must go out and the "UNARMED" warning light must come on. Press the "TEST" button and keep it pressed for 5-10 sec.; in this case, the elevator must deflect a little, till the elevator returns to the initial position.

21. Switch on the "CHECK" switch on the control panel. The "CHECK" warning light must come on. Turn the "RUDDER" knob on the control panel.

The rudder and ailerons must deflect.

Set the "RUDDER" knob in the zero position; in this case the rudder and ailerons must move to the neutral position. Repeat the check when turning the "RUDDER" knob in the opposite direction.

Turn the "ELEVATOR" knob on the control panel. The rudder must deflect. Set the "ELEVATOR" knob in the zero position; in this case the elevator must move to the neutral position. Repeat the check with the "ELEVATOR" knob turned in the opposite direction.

NOTE: It is permitted to check how the autopilot responds to control signals by means of No.1 and No.2 (steps 17-23) when sending the signals directly from the V-13 station. In this case do not disconnect plug connector No.12 from the V-13 unit and use the "V-13" control panel instead of the ground test control panel.

9. CALIBRATING THE V-13 AUTOPILOT OUTPUT SIGNALS

The V-13 autopilot output signals are calibrated when adjusting the alignment equipment of the V-13 missile, 2 version, at the MIRA plant.

Given below are the instructions for calibrating the signals.

1. Install the "G" gyro unit on the special test table and connect the gyro unit plug connectors at output of pins 8 (steps 1 and 3). Connect the "G" gyro test plug connector No.42 to the "G" gyro plug connector of the "V-13" control panel through the connecting cable.

Adjust the direction channel as follows:

2. At the "V-13" AUTOPILOT OUTPUTS of the control panel in the "V-13" "Gyro" position the switch on the "V-13" switch of the "V-13" control panel.

Connect the "G" terminal of the "G" connector (which is 30 V, direction value - not more than 0.25 V, inner resistance - not less than 2 kOhm, degree of precision - 0.05) to the "G" terminal of the control panel and the "G" terminal to the "G" terminal on the control panel.

After the "POWER" warning lights come on (but not earlier than 3 min. after power is supplied) press the "UNLOADING" button.

3. Setting the switch on the "TEST" switch of the control panel in the "POWER", "ON" and "UNLOADING" positions in turn, measure supply voltage, output signal from the free gyro and the gyro unit feedback output signal by the voltmeter connected.

4. Measure as specified in step 3 with the gyro unit turned about the vertical axis in the following succession:

to the right through the angles of: 1° , 3° , 6° , 9° , 11° ;

reverse travel: 8° , 5° , 2° , 0° ;

to the left through the angles of: 1° , 3° , 6° , 9° , 11° ;

reverse travel: 8° , 5° , 2° , 0° .

Before measuring with the gyro unit turned to the left, cut off power supply for a short time using the "POWER" switch of the control panel and then send the "UNLOADING" command.

NOTE: Test are as specified in steps 3 and 4 for not more than 3 min.

5. Set the "POWER" switch on the control panel in the "OFF" position.

Enter the check results in the table (at the end of section II.)

Adjust the pitch channel as follows:

6. Switch on the "POWER" switch on the control panel. Connect the "+" terminal of the D.C. voltmeter, indi-

ated in step 2, to the 14 terminal on the control panel and 15 terminal of the voltmeter to the 15V/50V terminal on the control panel.

After the 15V/50V warning lights come on (but not earlier than 1 min. after power is supplied) press the "RECORDING" button.

7. When setting the "RECORDING" switch in the "ON" position of the control panel in the "ON", "OFF" and "RECORDING" positions in turn, measure the voltage output signal from the gyro and 15V/50V control unit and the output signal of the voltmeter connected.

a. Measure as specified in step 7 with the 15V/50V unit turned about the lateral axis as follows:

1. through 0° to 90°: 0°, 30°, 60°, 90°, 120°.

reverse travel: 120°, 90°, 60°, 30°, 0°.

down through the 15V/50V: 15V, 10V, 5V, 0V.

reverse travel: 0V, 5V, 10V, 15V.

Before commencing with the 15V/50V unit turn it down.

8. Turn off power supply for a short time using the "OFF" switch on the 15V/50V control panel and then start the "RECORDING" command.

NOTE: Measure as specified in steps 7 and 8, for not more than 5 min.

9. Set the "OFF" switch on the 15V/50V control panel in the "OFF" position. Enter the measurements obtained in Table.

10. Return on the "RECORDING" switch on the 15V/50V control panel. Connect the 14 terminal of the 15V/50V voltmeter, indicated in step 2, to the 14 terminal on the control panel and 15 terminal of the voltmeter to the 15V/50V terminal on the control panel.

After the "BATT" indicator lamp lights come on (but not earlier than 3 min. after power is supplied), press the "UNWINDING" button.

11. When setting the "BATT" indicator lamp, ON "OFF" of the control panel in the "COAST" position, and "FEEDBACK" position in turn, measure supply voltage, output signal of the free port and the servo unit feedback output signal by the voltmeter leads etc.

12. Measure as specified in step 11 with the servo unit turned about its longitudinal axis as follows:

to the right through the angles: $0^{\circ}, 30^{\circ}, 60^{\circ}, 90^{\circ}$;

reverse travel: $180^{\circ}, 150^{\circ}, 120^{\circ}$;

to the left through the angles: $0^{\circ}, 30^{\circ}, 60^{\circ}, 90^{\circ}$;

reverse travel: $180^{\circ}, 150^{\circ}, 120^{\circ}$.

Before repeating with the servo unit turned to the left cut off power supply for 1 min. to the control panel and then send the "UNWINDING" signal.

13. Measure as specified in step 11 with the servo unit now turned back to the "COAST" position.

14. Put the "FEEDBACK" switch on the "OFF" control panel in the "COAST" position, enter the control values measured in the Table.

1. The missile shall be stored in the following conditions:

a. In the case of missiles reserved in conformity with the present instruction, missiles on preservation are stored in the "X" winged missile with all the rocket unit installed or with the gyro unit removed from the missile for one year since the date of arrival to the point of destination.

b. When the gyro unit is removed from the missile, it should be stored in the same conditions as in the metal case manufactured according to drawing 39.00.00.000.

c. The missiles shall be stored with suspension and in the manner shown in the technical drawing for 1 month throughout the entire guaranteed service life.

d. It is permitted to store the "X" rocket unit set or its individual units which were not installed in the "X" missile and which were packed in the metal case, manufactured according to drawings 39.00.00.000 and 39.00.00.000 for one year since the date of arrival to the point of destination.

e. The "X" rocket unit set in the boxes in the packing is permitted to be installed in the "X" missile for not more than 3 months since the date of acceptance by the Customer at the Air Plant and permitted to be stored as specified in paragraph 1.

3. It is permitted to keep the M-48 autopilot in the "R" missile covers with a tarpaulin cover in the open air for 3 days.

4. The depot intended for storage by outdoor in steps 1a and 1b must be well ventilated.

5. The depot must be equipped with the instruments to monitor its temperature and humidity. The temperature and humidity must be checked every day in the morning and at the end of working day.

The results of the control must be entered in the log book.

6. The depot must have painted wooden floor, asphalt, tile, enamel or cement floor. Never store the equipment in the depots having an earthen floor.

7. The depot must be free from acid and alkali vapours detrimental to equipment and also free from flammable vapours, etc.

8. The depot must be clean, the floor must be cleaned by means of wet dusting or by using vacuum cleaners. Do not sweep the depot floor, do not pour or splash water on the floor.

9. The M-48 autopilot set of spare parts, tools and equipment (Table No. 5) is furnished by the depot plant and comprises the following equipment and tools:

Table No. 5

| No. | Name | Code | -SP per one set | Log.No. |
|-----|-----------------|------|-----------------|-----------|
| 1 | | | | 5 |
| 1. | gyro unit | 71-1 | | 711100000 |
| 2. | servo unit | 71-2 | | 711100000 |
| 3. | timer | 71-3 | | 711100000 |
| 4. | relay regulator | 71-4 | | 711100000 |

| | 2 | 3 | 4 | 5 |
|------------------------|-------|----|---|----------------|
| 5. Relay, certificate | | | | |
| PRC. 3.001.00 | 100-0 | | | PRC. 3.001.00 |
| 6. Fuse, glass | 10-1 | 5 | | 10-1-10-1-10-1 |
| 7. Fuse, glass | 10-1 | 10 | | 10-1-10-1-10-1 |
| 8. 1/2" steel bolt | | 1 | | 10-1-10-1-10-1 |
| 9. Shipping container | | | | 10-1-10-1-10-1 |
| 10. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 11. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 12. Shipping container | | | | 10-1-10-1-10-1 |
| 13. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 14. Relay, certificate | | | | 10-1-10-1-10-1 |
| PRC. 3.001.00 | 100-0 | | | PRC. 3.001.00 |
| 15. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 16. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 17. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 18. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 19. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 20. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 21. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 22. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 23. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 24. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 25. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 26. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 27. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 28. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 29. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 30. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 31. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 32. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 33. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 34. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 35. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 36. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 37. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 38. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 39. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 40. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 41. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 42. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 43. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 44. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 45. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 46. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 47. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 48. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 49. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 50. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 51. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 52. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 53. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 54. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 55. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 56. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 57. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 58. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 59. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 60. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 61. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 62. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 63. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 64. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 65. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 66. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 67. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 68. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 69. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |
| 70. 1/2" steel bolts | | 1 | | 10-1-10-1-10-1 |

and 637-1, a complete set of spare parts, tools and devices, box manufactured according to drawings 637.02.00.000, 637.01.0.0.00 and 637.1.00.000.

The set of spare parts, tools and devices is packed and stored in the same way as the AIL-50 autopilot.

The difference is:

a) Installed on the missile is cost 637.04.00.000 instead of 637.04.00.000. The mountings with 54-110 relay regulators and boxes with 54-110 polarized relays and 54-110 and 54-110 fuses.

b) When the tool kits are packed in a wooden box (arg. 637.04.00.000).

NOTE: It is permitted to keep the autopilot tool kit in the general tool kit for the "KC" missile.

When storing, periodically check the autopilot units incorporated in the set of spare parts, tools and devices in the same manner as the autopilot and its individual units which were not installed in the "KC" missile and which are stored in the cans.

It is permitted to store the autopilot in the "KC" missile, the version covered with a tarpaulin cover in the hangar for a period throughout the entire guaranteed service life.

NOTE: The "KC" missile, the "KC" missile in the "KC" missile.

1. When storing the ANK-5 autopilot in the "KC" missile (or with the ANK-5 gyro unit removed from the missile) preserved in accordance with the present 80-05-111, edition III, instructions on preservation and extended storage of the "KC" winged missile, check after every 4 months 10% of the ANK-5 autopilots of the batch but not less than 3 autopilots.

NOTE: The ^{the} batch is γ number of autopilots subjected to γ tests for the month.

2. When storing the γ autopilot in the "100" missile covered with a cardboard cover in the hanger, check all 100% of the autopilot at least once a month.

3. When storing the γ autopilots, which were not installed in the "100" missile, and the autopilot individual units packed in cases, check after γ months 10% of the γ autopilots (their individual units) at least but not less than 2 autopilots (units).

4. Periodically check as specified in step 3 the γ autopilots which were not checked during the previous period of checks.

5. When storing, periodically check the temperature in the storage units meet the requirements outlined in step 3. During the γ of the temperature in the room must be within $\pm 5^{\circ}$ to $\pm 10^{\circ}$.

NOTE: The γ autopilot is not covered in step 3.

6. The time of the γ autopilots in the hanger.

7. The time, required for a continuous operation of the autopilot energized during all the checks specified in these instructions, must not exceed on 1.5 hours or follow-up on 1.5 hours or not less than half an hour.

8. If necessary, it is permitted to change the succession of checks; in this case the autopilot programmed operation and the γ autopilot (individual) is checked during the first 10 min. after the autopilot is switched on.

7. If the AIR-5 autopilots, taken for the next check in turn, are defective (corrosion included), check an additional number of the autopilots equal to the initial number of the autopilots to be checked.

If similar or some other defects are found in the autopilots checked, check all the 100% of the autopilots included in the batch.

8. If during the check of an additional number of the AIR-5 autopilots (checked accord. to step 6), defects are not found, all the autopilots of the batch checked (defective excluded) can be admitted to a further storage.

The way of delivering the unsatisfactory reports and elimination of defects in the defective units is given in the "Instructions for making up the unsatisfactory reports".

9. During each periodic check enter the results of checks and information on all the operations performed during the inspection and check in the certificate for the autopilot and its individual units.

10. The AIR-5 autopilot operating time, required for the periodic checks during storage, is determined by the time required for the checks specified by these Instructions.

11. After the expiration of the AIR-5B autopilot storage life (for all specified storage conditions), check all the

autopilots as specified in these instructions for the periodic checks during storage.

The decision on the ANK-5B autopilot further storage and operation is adopted by the commission appointed by the organization commander.

12. CHECKING THE ANK-5B AUTOPILOT OPERATION IN STORAGE WITHOUT REMOVING IT FROM THE "KC" MISSILE

1. After decompressing the "KC" missile and attaching the missile wings, remove the H-3 gyro unit from the missile.

Visually inspect all the autopilot units. Check that the units and cables outer surfaces are free from damage.

If corrosion is found on the autopilot units, proceed as outlined in steps 7-8, par. 20, these instructions.

2. Disconnect plug connectors No.32 and 33 from the missile wiring system and check the H-4 servo unit as indicated in par. 6 (steps 3-6): when checking the H-4 rudder servo unit, connect plug connector No.32 to the AL-1 panel, when checking the H-4 elevator servo unit, connect plug connector No.33 and when checking the H-4 ailerons servo unit connect plug connector No.35.

NOTE: During this check the H-4 servo unit outlet shaft direction of rotation indicated in

par. 6 (steps 3-6) corresponds to deflection of the control surface (ailerons) connected to the H-4 servo unit to be checked.

2. When checking at a temperature below 0°C , (when storing the "K2" missile in the hangar), the H-4 servo units sensitivity must be:

with the "WINDING SELECTOR SWITCH" in "1", "2" and "3" positions...0.3-1.56 mA and in "4" position0.62-2.82 mA

When checking sensitivity use the [U-] panel with the H-70 test instruments at a temperature of -5°C and with the M5-2 test instruments at a temperature of -40°C .

3. Check the H-4 rudder and elevator servo units without disconnecting plug connectors Nos. 32 and 34 via plug connector 31 by means of the connecting cable. After checking the H-4 servo units, connect plug connectors Nos. 32 and No. 33 to the missile wiring system.

4. During the ANK-5B autopilot storage under normal conditions the sensitivity of the H-4 servo units installed on a fixed base should be 0.5-1.2 mA with the "WINDING SELECTOR SWITCH" in "1", "2" and "3" positions and 0.95-2.22 mA - in the "4" position.

3. Disconnect plug connectors Nos 40 and 41 of the missile wiring system from the HAF-1PA inverters and check the inverters operation as outlined in par. 6 (steps 8-10).

NOTE: When checking the HAF-1PA inverters at a temperature below 0°C (when storing the "KC" missile in the hangar) use the H-3 panel with the H-70 and H-70 test instruments only to check rotation of the H-3 panel gyro motors without measuring the input and output current and the voltage generated by the inverter.

4. Install the H-3 gyro unit on the H-5 turn table and connect the gyro unit plug connectors as indicated in par. 8 (steps 3 and 4).

5. Check the autopilot operation as specified in par. 8 (steps 5-12).

NOTES: When checking at a temperature below 0°C (when storing the "KC" missile in the hangar):

- a) apply the "UNCAGING" command, 6 min. after power is supplied;

b) the elevator must return to the initial position 40-43 sec. after the "H-18MO START." button is pressed.

6. Check the time required for the yaw and pitch gyro bases to match in the zero position as follows:
switch on the "POWER" switch on the H-I control panel. After the "BASES ZERO" warning lights come on, set the "POWER SELECTOR SWITCH" in the "BOARD CHECK" position and switch on the "CHECK" switch. The "BOARD CHECK" and "CHECK" warning lights must come on.

Fully turn the "RUDDER" knob on the control panel to the "RIGHT". The rudder must smoothly, without jerks, deflect to the right and the right aileron must deflect up. Wait for 7 min. Set the "RUDDER" knob in the zero position and the "CHECK" switch in the "OFF" position. The rudder must move to the neutral position. After 4.5-6.5 min. the ailerons must move to the neutral position and the "BASES ZERO" warning lights must come on.

Switch on the "CHECK" switch and repeat the check with the "RUDDER" knob turned to the "LEFT",

After the "BASES ZERO" warning lights come on switch on the "CHECK" switch and fully turn the "ELEVATOR" knob upward.

The elevator must smoothly, without jerks deflect up. Make an interval for 4 min. Set the "ELEVATOR" knob in the zero position and the "CHECK" switch in the "OFF" position. The elevator must move to the neutral position. After 2-3.5 min the "BASES ZERO" warning light must come on.

Switch on the "CHECK" switch and repeat the check with the "ELEVATOR" knob turned to the "DOWN" position.

Check the time required for the bases to match at a supply voltage of 26 V.

7. Check the autopilot transmission ratios as indicated in par. 15, step 6.

NOTES:

1. When checking at a temperature below 0°C (when storing the "KC" missile in the hangar):
 - a) make an interval for 7.5 min. when sending the "DIRECTION" signal; in this case the "BASES ZERO" warning lights must come on 4-7 min. after the "CHECK" command is removed.
 - b) when sending the "PITCH" signal, make an interval for 5 min.; in this case the "BASES ZERO" warning lights must come on 1.5-4.0 min. after the "CHECK" command is removed.
 - c) do not check the autopilot transmission ratios.

2. When storing the "KC" missiles in the hangar, check the time required for the bases to match once in 6 months.

8. Set the "POWER" switch on the II-1 control panel in the "OFF" position. Disconnect the II-2 gyro unit plug connectors and remove the gyro unit from the turn table. Install the II-2 gyro unit in the "KC" missile and check the autopilot operation using the IHK ground test control panel as outlined in par. 8 (steps 17-24).

9. Enter the results of checks and time required for checking the units and autopilot set energized in the certificate of the individual units and AKA-5B autopilot set.

10. It is permitted to check the H-4 gyro unit in a reference or any other serviceable autopilot set system as indicated in par. 6 (steps 14-23).

In this case do not check the autopilot stored in the set but check the H-4 servo unit, H-1840 timer and HAF-10A inverter which are stored in the missile as follows:

- a) H-4 servo units - as outlined in par. 6 (steps 3-6 ;
- b) H-1840 timers - as outlined in steps 11-13, this par.
- c) HAF-10A inverters - as outlined in par. 6 (steps 8-10)

11. Check the H-1840 timers as follows:

disconnect plug connector No.33 from the missile wiring system. Set the "PANEL" switch of the H-1 panel in the "OFF" position.

Supply power of 26 V d.c. to the control panel. Connect the H-1840 timer plug connector No.33 to the panel via the connecting cable. Set the "PANEL" selector switch in the "H-1840" position and the "ELEVATOR DIRECTOR SWITCH" in the "ON" position.

12. Switch on the "POWER" and "FEEDBACK" switches. The elevator must move to the initial position (2.5° - 3° Up from the geometric neutral position).

Switch on the "H-1840 START" switch and simultaneously start the stop-watch. 2-3 sec. after the "H-1840 START" switch is on the elevators must deflect through an angle of 9 - 9.5° Up from the initial position (12 - 12.5° Up from the geometric neutral position) and 40-42 sec. after the switch is ON the elevator must return to the required initial position.

Start the H-18MO timer twice. When starting the timer for the first time, check the elevator angle of deflection and the program starting time (2-3 sec.), to do this, start the stop-watch when the elevator deflects upward. When starting the timer for the second time, check the time of the program completion (40-42 sec.): to do this, stop the stop-watch when the elevator begins moving to the initial position. The second check is performed 20-30 seconds after the first actuation of the program is over.

NOTE: 1. It is permitted to adjust the H-18MO timer rheostat if the elevator fails to deflect through an angle of 12° - 12.5° up from the geometric neutral position.

2. If it is necessary to check the programmed operation for the third and subsequent times, bear in mind, that the H-18MO timer operating duty is intermittent consisting of 6 cycles followed by a complete cooling. A cycle implies one actuation of the program.

3. If two stop-watches are available, check the program at a single switching-on of the H-18MO timer.

12. Set the "POWER" switch on the panel in the "OFF" position. Disconnect the panel from the H-18MO timer plug connector and connect this plug connector to the missile wiring system.

13. CHECKING THE AHA-5B AUTOPILOT OPERATION IN STORAGE WITH SOME UNITS REMOVED FROM THE MISSILE

1. After the "B" missile is depreserved and its wings are attached, visually inspect the H-1 control panel, H-4 servo units, H-10M timer and HAP-1M inverters which are stored installed in the missile. Open the case with the H-2 gyro unit as indicated in par. 3. and visually inspect the unit. Check that the units outer surfaces and cables are free from damage.

If corrosion is detected, proceed as outlined in steps 7-8, par. 20.

2. Check the AHA-5B autopilot as indicated in par. 12 without checking the autopilot set by means of the TBM ground test control panel.

After checking the H-2 gyro unit, pack it in a metal case as indicated in par. 4 (without packing the H-1 control panel). Enter the results of checks and time required for checking the units and autopilot set energized in the certificates for the individual units and AHA-5B autopilot set.

14. CHECKING THE AHA-5B AUTOPILOT WHEN STORING IT PACKED IN TBM

1. Inspect the packing cases. Check the cases for presence of seals and for freedom from damages. Unpack the autopilot units as indicated in par. 3. Inspect all the units. Check the outer surfaces of the units and cables for freedom from damages.

13. CHECKING THE AMB-5B AUTOPILOT OPERATION IN STORAGE WITH SOME UNITS REMOVED FROM THE MISSILE

1. After the "FOD" missile is deprotected and its wings are attached, visually inspect the H-1 control panel, H-4 servo units, H-10M timer and HAP-10A inverters which are stored installed in the missile. Open the case with the H-2 gyro unit as indicated in par. 3. and visually inspect the unit. Check that the units outer surfaces and cables are free from damage.

If corrosion is detected, proceed as outlined in steps 7-8, par. 20.

2. Check the AMB-5B autopilot as indicated in par. 12 without checking the autopilot set by means of the TEN ground test control panel.

After checking the H-2 gyro unit, pack it in a metal case as indicated in par. 4 (without packing the H-1 control panel). Enter the results of checks and time required for checking the units and autopilot set energized in the certificates for the individual units and AMB-5B autopilot set.

14. CHECKING THE AMB-5B AUTOPILOT WHEN STORING IT PACKED IN TAP

1. Inspect the packing cases. Check the cases for presence of seals and for freedom from damages. Unpack the autopilot units as indicated in par. 3. Inspect all the units. Check the outer surfaces of the units and cables for freedom from damages.

If corrosion is found on the autopilot units, proceed as outlined in steps 7-8, par. 20, these Instructions.

2. Check the H-4 servo units as indicated in par. 6 (steps 3-6); in this case, under normal conditions the sensitivity of the H-4 servo units installed on a fixed base is equal to 0.5-1.2 mA with the "BINDING SELECTOR SWITCH" in "1", "2" and "3" positions and 0.95-2.22 mA in the "4" position.

3. Check the HAI-12A inverters as indicated in par. 6 (steps 8-10).

4. Check the autopilot set operation as outlined in par. 6 (steps 14-23) and time required for the bases to match as outlined in par. 12 (step 6).

After the check is completed, pack the autopilot units in the metal case as indicated in par. 1 and enter the results of checks and time required for checking the units and autopilot set energized in the certificates for the individual units and set of the ABB-58 autopilot.

15. PROCEDURE OF REPLACING THE ABB-58 AUTOPILOT INDIVIDUAL UNIT AND COMPONENTS

1. If during the ABB-58 autopilot operation and storage defects are found, replace the H-1, H-2, H-4, H-18MO units, H2-1, H2-2, H2-3, H2-4, H2-6AM, components, polarized relay and trimming rheostat in the H-2 gyro unit, H2-1MO component in the H-4 servo unit and H-4-1MO component polarized relay.

2. Remove and install the units to be replaced in the "K" missile in accordance with the "Maintenance and Operating Instructions for the "K" Winged Missile", Book I.

3. Replace the H4-IMO component in the H-4 servo unit as follows:

remove the seal and unscrew by socket wrench two studs attaching the defective H4-IMO component to the H-4 servo unit and remove the component from the unit. Install a new H4-IMO component on the H-4 servo unit.

Carefully insert two attaching studs of the component into the holes in the component casing and tighten the studs by the socket wrench; tighten the studs alternately, and evenly, secure the studs with a locking wire and seal it with the using organization seal.

4. Replace the PHO polarized relay in the H-2 gyro unit as follows:

Unscrew 6 screws attaching the H-2 gyro unit side cover. Unscrew 4 screws attaching the defective relay to the H2-6M (H2-6AM) component and remove the relay out of the unit. Carefully install (without touching the electric wires) a new polarized relay in the H2-6M (H2-6MA) component and tighten the relay attaching screws; tighten the screws alternately and evenly. Secure the screws with AK-20 nitro glue according to instructions No. MB-621 (See the appendix). Screw the H-2 unit side cover, in this case safety the screws with AK-20 nitro glue according to instructions No. MB-621.

5. Replace the trimming rheostats as follows:

Remove the H-2 gyro unit lower cover.

Unsolder the wires from the trimming rheostat to be replaced and measure the resistance set for the given rheostat.

3. Replace the H4-110 component in the H-1 servo unit as follows:

remove the seal and unscrew by socket wrench two studs attaching the defective H4-110 component to the H-1 servo unit and remove the component from the unit. Install a new H4-110 component on the H-1 servo unit.

Carefully insert two attaching studs of the component into the holes on the component casing and tighten the studs by the socket wrench; tighten the studs alternately, and evenly, secure the studs with a locking wire and seal it with the using organization seal.

4. Replace the H10 polarized relay in the H-2 gyro unit as follows:

Unscrew 6 screws attaching the H-2 gyro unit side cover. Unscrew 4 screws attaching the defective relay to the H2-6M (H2-6MA) component and remove the relay out of the unit. Carefully install (without touching the electric wires) a new polarized relay in the H2-6M (H2-6MA) component and tighten the relay attaching screws; tighten the screws alternately and evenly. Secure the screws with AK-20 nitro glue according to instructions No. KP-21 (see the appendix). Screw the H-2 unit side cover, in this case safety the screws with AK-20 nitro glue according to instructions No. KP-21.

5. Replace the trimming rheostats as follows:

Remove the H-2 gyro unit lower cover.

Unsolder the wires from the trimming rheostat to be replaced and measure the resistance set for the given rheostat.

3. Replace the HI-10 component in the HI-10 servo unit as follows:

Remove the seal and unscrew by socket wrench two studs attaching the defective HI-10 component to the HI-10 servo unit and remove the component from the unit. Install a new HI-10 component on the HI-10 servo unit.

Carefully insert two attaching studs of the component into the holes in the component using and tighten the studs by the socket wrench; tighten the studs alternately, and evenly, secure the joints with a locking wire and seal it with the using organization seal.

4. Replace the HI-10 polarized relay in the HI-10 gyro unit as follows:

Unscrew and remove the HI-10 gyro unit side cover. Unscrew 4 screws attaching the defective relay to the HI-10 (HI-10A) component and remove the relay out of the unit. Carefully install (without touching the electric wires) a new polarized relay in the HI-10 (HI-10A) component and tighten the relay attaching screws; tighten the screws alternately and evenly. Secure the screws with HI-20 nitro glue according to instructions No. HI-10 (see the appendix). Screw the HI-10 unit side cover, in this case safety the screws with HI-20 nitro glue according to instructions No. HI-20.

5. Replace the trimming rheostats as follows:

Remove the HI-10 gyro unit lower cover.

Unsolder the wires from the trimming rheostat to be replaced and measure the resistance set for the given rheostat.

3. Remove the R-1 component in the R-1 servo unit as follows:

Remove the R-1 component by socket wrench two studs attaching the R-1 component to the R-1 servo unit and remove the component from the unit. Install a new R-1 component in the R-1 servo unit.

Carefully insert the attaching studs of the component into the R-1 servo unit and tighten the studs by the socket wrench. Tighten the studs alternately, and evenly, and secure the unit with a locking wire and seal it with the usual security wire seal.

4. Replace the R-1 component relay in the R-1 gyro unit as follows:

Unseal the R-1 gyro unit side cover. Unseal the R-1 gyro unit side cover. Remove the R-1 component relay to the R-1 gyro unit. Carefully (without touching the electric wires) a new R-1 component relay in the R-1 gyro unit. Tighten the screws attaching screws. Tighten the screws alternately and evenly. Secure the screws with R-1 nitro glue according to instructions No. R-1 (see the appendix). Screw the R-1 gyro unit side cover, in this case safety the screws with R-1 nitro glue according to instructions No. R-1 .

5. Replace the trimming rheostats as follows:

Remove the R-1 gyro unit lower cover.

Unseal the wires from the trimming rheostat to be replaced and measure the resistance set for the given rheostat.

2. Remove the defective component in the B-1 servo unit as follows:

Remove the defective component by socket wrench two studs attaching the defective component to the B-1 servo unit and remove the unit from the unit. Install a new B-1 component in the B-1 servo unit.

Securely mount the attaching studs of the component into the unit and the component using and tighten the studs by the socket wrench. Tighten the studs alternately, and evenly, and secure them with a locking wire and seal it with the using of the wire seal.

3. Replace the defective component in the B-2 gyro unit as follows:

Insert the B-2 gyro unit side cover. Insert the defective relay to the B-2 gyro unit. Carefully install the defective relay out of the unit. Carefully install the defective relay (electric wires) a new B-2 gyro unit (B-2-M1) component and tighten the screws. Tighten the screws alternately and evenly. Use the screws with B-20 nitro glue (see the appendix). Secure the B-2 gyro unit side cover, in this case safety the screws with B-20 nitro glue according to instructions No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 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799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

5. Replace the trimming rheostats as follows:

Remove the B-2 gyro unit lower cover.

Insert the trimmer from the trimming rheostat to be replaced and adjust the resistance set for the given rheostat.

5. Reinstall the H-3 component in the H-1 servo unit as follows:

Remove the H-3 and unscrew by socket wrench two studs attaching the H-3 component to the H-1 servo unit and remove the component from the unit. Install a new H-3 component in the H-1 servo unit.

Insert the attaching studs of the component into the H-1 servo unit component housing and tighten the studs by the socket wrench, tighten the studs alternately, and evenly, secure the unit with a locking wire and seal it with the usual maintenance seal.

6. Replace the H-4 polarized relay in the H-5 gyro unit as follows:

Remove the H-5 gyro unit side cover. Insert a screwdriver under the defective relay to the H-5 (H-5) component and remove the relay out of the unit. Carefully inspect the unit touching the electric wires) a new electric relay in the H-5 (H-5A) component and tighten the attaching screws; tighten the screws alternately and evenly. Secure the screws with H-20 nitro glue (see the instructions No. H-20) (see the appendix). Remove the H-5 gyro unit side cover, in this case safety the screws of the side cover according to instructions No. H-20.

7. Replace the trimming rheostats as follows:

Remove the H-5 gyro unit lower cover.

Unscrew the screws from the trimming rheostat to be replaced and remove the resistance set for the given rheostat.

3. Remove the 10-11 component in the 10-1 servo unit as follows:

Remove the seal and unscrew by socket wrench two studs attaching the 10-11 component to the 10-1 servo unit and remove the component from the unit. Install a new 10-11 component in the 10-1 servo unit.

Securely insert the attaching studs of the component into the holes in the component casing and tighten the studs by the socket wrench. Tighten the studs alternately, one evenly, and secure the casing with a binding wire and seal it with the unit's rubber case seal.

4. Replace the 10-12 solenoid relay in the 10-2 gyro unit as follows:

Loosen the screws securing the 10-2 gyro unit side cover. Increase the pressure under the defective relay to the 10-12 (10-12) component and remove the relay out of the unit. Carefully install (without touching the electric wires) a new 10-12 component in the 10-2 (10-12) component and tighten the relay attaching screws. Tighten the screws alternately, one even. Secure the screws with 10-12 nitro die sealant. Refer to the appendix for the appendix. Remove the 10-2 side cover, in this case safety the screws are secured by the unit. According to instructions in the appendix.

5. Replace the trimming rheostat as follows:

Remove the 10-3 gyro unit lower cover.

Unscrew the screws from the trimming rheostat to be replaced. Measure the resistance set for the given rheostat.

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2. Remove the defective component in the H-1 servo unit as follows:

Remove the cover and unscrew the socket wrench the studs attaching the defective H-1 component to the H-1 servo unit and remove the component from the unit. Install a new H-1 component on the H-1 servo unit.

Carefully insert the attaching studs of the component into the unit and the component using oil. Tighten the studs by the socket wrench. Tighten the studs alternately, and evenly, and seal the studs with a locking wire and seal it with the union combination seal.

3. Replace the H-1 polarized relay in the H-1 gyro unit as follows:

Unscrew the screws attaching the H-1 gyro unit side cover. Unscrew the screws attaching the defective relay to the H-1 (H-1) component and remove the relay out of the unit. Carefully install (without touching the electric wires) a new polarized relay in the H-1 (H-1) component and tighten the relay attaching screws: tighten the screws alternately and evenly. Seal the screws with H-13 nitro glue according to instructions No. H-1 (see the appendix). Remove the H-1 unit side cover, in this case safety the screws attaching the side cover according to instructions No. H-1.

4. Replace the trimming rheostats as follows:

Remove the H-1 gyro unit lower cover.

Unscrew the screws from the trimming rheostat to be replaced and measure the resistance set for the given rheostat

Unscrew the screws attaching the plate with the trimming rheostat to the servo unit casing. Unscrew the nut attaching the rheostat to be removed and remove the rheostat.

Install a new rheostat in place. Secure the rheostat by a screw with a nut (place a washer under the nut).

Install the rheostat without any cant, the adjusting screws must have a clearance between the screw head and hole in the upper plate.

Set the rheostat resistance equal to that measured before the rheostat is replaced.

Join the wires to the trimming rheostat. Attach the plate with the trimming rheostat to the servo unit casing using the screws (place washers under the screw heads).

Tighten the attaching screws and nuts with H-38 bit/wrench according to instructions No. 75-102.

6. After the servo unit is replaced, proceed as follows:

a) Check the auto pilot transmission ratio as outlined in steps 5-13, par. 8 (note that the auto pilot unit is stored in the missile as with the unit removed from the assembly as outlined in steps 5-13, par. 8 (note that auto pilot is stored in the missile).

b) Check the auto pilot transmission ratio as described below:

NOTE: 1. Check the auto pilot transmission ratio at a temperature not below 5°C.

2. The method of checking the H-38 auto pilot transmission ratios refer to storage of the servo unit installed in the H-38 missile.

If the autopilots are packed in the cases the methods of checking the autopilot transmission ratios are the same; in this case the amount of the H-4 servo units outlet shafts turn must be:

With the H-2 gyro unit deviated in yaw; direction control surface (rudder) - $2.25-2.75^{\circ}$ (instead of $2.1-2.9^{\circ}$)
roll control surface (aileron) $4-5^{\circ}$ (instead of $3.8-5.3$)

With the H-2 gyro unit deviated in pitch:

elevator - $4.5-5.5^{\circ}$ (instead of $4.3-5.8$)

With the H-2 gyro unit deviated in roll:

roll control surface (aileron) - $4.5-5.5^{\circ}$ (instead of $4.3-5.8$).

3. Check the autopilot transmission ratios at a power supply of 26 V d.c.

Check the rudder transmission ratio and the angle of the H-4 aileron servo unit turn controlled by the coordination signals as follows:

After sending the "UNCLAMP" command, turn the H-2 gyro unit in yaw through an angle of 5° . The rudder must deflect $2.1-2.9^{\circ}$ and ailerons - through an angle of $3.8-5.3^{\circ}$.

Turn the H-2 unit in opposite direction through an angle of 5° in yaw. The rudder and ailerons must deflect respectively through the angles of $2.1-2.9^{\circ}$ and $3.8-5.3^{\circ}$ to the opposite side.

- NOTES:
1. The difference in the ailerons deflection in both directions must not exceed 0.5° .
 2. If the rudder deflection does not meet the required value, adjust the H-2 gyro unit rheostat No.3 connected in the yaw free gyro circuit. To do this, remove the lower cover of the H-2 gyro unit and rotate rheostat No.3 screw till the required deflection of the rudder is obtained. It is permitted to adjust the rheostat No.3 within 290 ± 29 ohms. The place of the bridge connection for checking the resistance value is given in Table No.3
 3. If the ailerons deflection does not meet the required value, adjust rheostat No.12 connected in the coordination signal circuit. It is permitted to adjust rheostat No.12 within the range of 300 ± 30 ohms.

Check the elevator transmission ratio as follows:

after sending the "UNWAGING" command, turn the H-2 gyro unit in pitch through an angle of 5° . The elevator must deflect $4.3-5.8^{\circ}$. Turn the H-2 gyro unit in pitch through an angle of 5° in the opposite direction. The elevator must deflect through an angle of $4.3-5.6^{\circ}$ in the opposite side.

NOTE: If the elevator deflection does not meet the required value, adjust rheostat No.5 connected in the pitch free gyro circuit. It is permitted to adjust rheostat No.5 within the range of 115 ± 11.5 ohms.

Check the ailerons transmission ratio as follows:

After sending the "UNCAGING" command, turn the H-2 gyro unit in roll through an angle of 10° . The ailerons must deflect $4.3-5.8^\circ$.

Turn the H-2 gyro unit in roll through an angle of 10° in the opposite direction.

The aileron must deflect $4.3-5.8^\circ$ in the opposite side.

NOTE: If the ailerons deflection does not meet the required value, adjust rheostat No.10 connected in the roll feedback circuit. It is permitted to adjust rheostat No.10 within the range of 100 ± 5 ohms.

Table No.6

| Resistor No. | Name of electric circuit | Pins across which measurement is performed. | Resistance ohms |
|--------------|----------------------------------|---|-----------------|
| 3 | Yaw free gyro signal circuit | 31/3-42/2 | 290 ± 29 |
| 5 | Pitch free gyro signal circuit | 31/22-42/4 | 115 ± 11.5 |
| 10 | Roll feedback signal circuit | 35/11-35/13 | 100 ± 5 |
| 12 | Bank coordination signal circuit | 35/7-35/8 | 300 ± 30 |

- NOTES:
1. Check resistance by a d.c. bridge having the degree of precision not less than 2.5.
 2. The plug connectors pins are arbitrarily designated: the numerator shows the number of the plug connector and the denominator - the number of the plug connector pin.
 3. When checking, connect the plugs to the units mating receptacles. Connect the measuring bridge wires to the pins (sockets) of the plug connected.
 4. Pins 31/3-42/2; 31/22-42/4 refer to II-2 gyro unit and are manufactured according to a special order with connector plug No.42. Measure resistors 2,5 of the production units across their contacts.
 7. After replacing the II-4 unit or II-1MO component (or polarized relay in this component) check as outlined in par. 6 (steps 3-6) and check transmission ratio of the corresponding channel of the autopilot as described in step 6, this paragraph).
 8. After replacing the II-1MO timer check as indicated in step 8, par. 3 (when storing the II-1MO timer in the missile) or as in step 17, par. 6 (when storing the timer in a packing case).
 9. After replacing the II-1 control panel, check as outlined in steps 2-9, par. 3 (when storing the panel in the missile) or as in steps 13-14, par. 6 (when storing the panel in a packing case).

10. After the П2-6M, П2-6AM components or PNC polarized relay in the П2 gyro unit are replaced, check as specified in steps 7, 10 and 11, par. 6 (when storing all the autopilot units installed in the "22" missile or with the П2-gyro unit removed from the missile) or as in steps 10, 12 and 20 par. 6 (when storing the autopilot units in packing cases).

11. After replacing the П2-1 or П2-2 component in the П2 gyro unit, check as indicated in steps 5, 7-12, par. 6 (when storing all the autopilot units installed in the "22" missile or with the П2 gyro unit removed from the missile) or as in steps 10, 10-12, par. 6 (when storing the autopilot units in packing cases) and check the transmission ratio of the corresponding channel as outlined in step 6, this paragraph.

12. After replacing the П2-3 component in the П2-gyro unit, check as indicated in steps 5, 9, 12 par. 6 (when storing all the autopilot units installed in the "22" missile or with the П2 unit removed from the missile) or as in steps 14, 13, 22, par. 6 (when storing the autopilot in packing cases) and check the all-around collection transmission ratio as indicated in step 6, this paragraph.

13. After replacing the П2-4 component in the П2 gyro unit, check as specified in step 6, par. 6 (when storing all the autopilot units installed in the missile or with the П2 gyro unit removed from the missile) or as in step 15, par. 6 (when storing the autopilot units in packing cases).

14. After replacing trimming racestate No. 3, 5, 10 and 12, check the transmission ratio of the corresponding channel as outlined in step 6, par. 12.

4. The flight instructor, who was not a pilot, said the required minor flight instructor license in 1953 autopilot individual was not met.

SECTION IV

1. PRE-FLIGHT CHECKS

a. PRE-FLIGHT CHECKS OF THE AIR-TO-AIR AUTOPILOT

1. Perform a separate check of the AIR-TO-AIR autopilot during the pre-flight preparation as outlined below, bear in mind that:

a) the autopilot stored/installed in the "X" missile must not be subject to preliminary checks;

b) the autopilot, i.e., individual units are stored being removed from the "X" missile, must be preliminarily checked, irrespective of the time of the previous periodic checks, i.e., at pps. 1, and after that the "X" missile unit is installed in the missile;

c) the autopilot stored in packing cases must be preliminarily checked, irrespective of the time of the previous periodic checks, i.e., at pps. 1, and after that all the autopilot units must be installed in the missile.

2. Using a crane, place the "X" missile from the container on an airfield cart.

3. Connect plug connector No. 26 of the ground control panel via the connecting cable to the autopilot (verify check plug connector No. 26 and plug connector No. 12 of the panel through the connecting cable - to the missile wiring system plug connector No. 12, having disconnected this plug connector from the K4-101 unit.

with a 1000 watt power supply and a power of 2000 watt.

4. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel.

The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel.

5. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel.

6. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel.

7. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel.

8. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel.

9. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel. The power supply is connected to the control panel.

3. If two stop-watches are available, check the program at a single switching-on of the W-1000 timer.

4. Check as outlined in this step and step 11, this paragraph during the first 30 minutes after the autoriset is OK.

5. Upon checking at a temperature below 40°E, the elevator must return to the initial position 10-15 sec. after the "W-1000 STOP" button is pressed.

6. Inclined the missile by the wire to the right. The right aileron must deflect down. Inclined the missile to the left. The right aileron must deflect up. Set the missile in the original position; in this case, the ailerons must be set in the neutral position.

7. Switch on the "W-1000 No. 1" switch on the control panel. The "W-1000 No. 1" warning light must come on. Turn the "W-1000" knob on the panel. The rudder and ailerons must deflect. Set the "W-1000" knob in the zero position; in this case the rudder and ailerons must move to the neutral position. Repeat the check with the "W-1000" knob turned in the opposite direction.

Turn the "W-1000" knob on the panel. The elevator must deflect. Set the "W-1000" knob in the zero position, the elevator must move to the neutral position. Repeat the check with the "W-1000" knob turned in the opposite direction.

Note: Time, required for sending a signal of one pulse, must not exceed 15 seconds.

10. Switch on the "SUMM No.2" switch on the panel. The "COMMAND No.1" warning light must come on. Check how the control surfaces are controlled by the "RUDDER" and "ELEVATOR" pre-set units on the panel in the same way as when sending command No.1: In this case when setting the "RUDDER" and "ELEVATOR" knobs in the zero positions, the control surfaces and ailerons must not deflect to the neutral position. Set the "POWER", "COMMAND No.1" and "SUMM No.2" switches on the panel in the "OFF" position.

11. Using the "POWER" switch on the control panel cut off power supply for a short time. The "FAULT" warning light must come on, the control surfaces and ailerons must occupy the neutral position and the "FAULT" warning light must become illuminated.

Press the "UNWINDING" button on the control panel. The "FAULT" warning light must go out. After 2 minutes check the free gyro precession. The gyro rigidity must be so that the control surfaces deflection for 2 minutes would not exceed:

rudder $\pm 1.25^{\circ}$

elevator $\pm 2.5^{\circ}$

aileron $\pm 1.25^{\circ}$.

NOTE: The ailerons deflection also depends on the free gyro precession due to a signal picked up from the coordination potentiometer. Therefore, before determining the roll free gyro precession, switch on the "ROLL" switch on the panel and send the direction control signal of a low value and such a polarity that the rudder would move to the neutral position.

after that quickly remove the control signal. In this case the deflection of ailerons from the neutral position will correspond to the roll gyro precession.

12. Put the "OFF" switch on the [P-] control panel in the "OFF" position. Disconnect the ground test control panel from plug connectors No. 36 and 42.

Connect the missile wiring system plug connector No. 42 to the K1-12M unit.

Re-energize the missile electrical system.

17. ~~RE-ENERGIZING THE MISSILE ELECTRICAL SYSTEM~~
~~RE-ENERGIZING THE MISSILE ELECTRICAL SYSTEM~~

1. In order, following the K1-3M autopilot and K-12 station separate station, connect the ground test control panel plug connector No. 36, to the autopilot board. Check plug connector No. 36 with the connecting cable.

Switch on the "ON" switch on the panel and supply power of 28 ± 0.5 V to the missile electrical system.

2. Return to the K-12 station. The "ON" light (warning light on the panel) must come on. Wait till zero control currents are sent from the station to the autopilot (check by using the K1-3M panel).

Switch on the "ON" switch on the [P-] control panel. The "ON" light (warning light on the panel) must come on. After that, press the "SYNCHRON" button.

3. Send control signals from the K-12 station to regime

"ON".

When sending the "RIGHT" signal, the rudder must deflect to the right and the right aileron - up. When removing the signal the rudder and ailerons must move to the neutral position.

When sending the "LEFT" signal, the rudder must deflect to the left and the right aileron - down. When removing the signal the rudder and ailerons must move to the neutral position. When sending the "UP" signal, the elevator must deflect upward. When removing the signal, the elevator must move to the zero position.

When sending the "DOWN" signal, the elevator must deflect down. When removing the signal, the elevator must move to the zero position.

NOTE: Time, required for sending a signal of one polarity must not exceed 15 seconds.

4. Using the "STOP" switch on the H-I control panel cut off power supply for a short time. The "WARNING" warning light must come on.

Wait, till the control surfaces are in the neutral position and the "WARNING" warning light becomes illuminated. Set the "STOP" switch on the H-I control panel in the "OFF" position.

5. Send command No. 2 from the H-I station. The "WARNING No. 2" warning light on the panel must come on. Wait till zero control currents are supplied from the station to the autopilot.

Switch on the "CHECK" switch on the H-I control panel. The "CHECK" and "B.M. STOP" warning lights on the panel must come on. After 3 minutes press the "PURSING" button.

Send control signals in regime "B" from the K-1M station to the autopilot.

The direction of the control surfaces deflection must be the same as in step 3. When removing control signals the control surfaces must not move to the neutral position.

6. De-energize the autopilot as indicated in step 4. Disconnect the ground test control panel from plug connector No.36.

SECTION V

AIM-55 AUTOPILOT TEST BEFORE TAKE-OFF

18. TESTING THE AIM-55 AUTOPILOT BY USING THE CARRIER-
- AIRCRAFT EQUIPMENT

1. Connect the ground test control panel plug connector No.38 to the autopilot board check plug connector No.37 through the connecting cable.

Check that the "POWER" switches on the E-I control panel and "1-13M" unit are in the "ON" position.

2. Switch on the "SYSTEM POWER" and "AP AND E-1" switches on the bombardier control panel in the front cabin. The "AP AND E-1 DISCHARGE" warning light on the bombardier's panel comes on.

3. Check the autopilot operation using the ground test control panel:

a) switch on the "POWER" switch on the E-I control panel. The "CHARGE" and "BASIC ZERO" warning lights on the panel must come on.

b) after 2 minutes, press the "UNCAGING" button on the panel.

The "CHARGE" warning light must go out.

Press the "E-ELEVATOR START" button on the panel and keep it pressed for 5-10 seconds. The elevator must deflect $9-9.5^{\circ}$ up from the initial position ($12-12.5^{\circ}$ up from the geometric neutral position). Wait, till the elevator returns to the initial position.

c) switch on the "WALL" switch on the panel, and the control signals by turning the "RUDDER" and "ELEVATOR" pre-set units knobs. When sending the direction signal the rudder and ailerons must deflect and when sending the pitch signal the elevator must deflect. Set the "WALL" switch on the panel in the "OFF" position.

d) Using the "PUSH" switch on the panel control panel cut off power suppl. for a short time. The "WALL" warning light must come on. Wait, till the control surfaces and ailerons are set in the neutral position and the "BATT'S DOWN" warning light comes on.

4. Verify the panel signals and check the auto-pilot operation by the instruments in the front cabin:

a) calibrate the panel signals: the "WALL" warning light on the panel must be illuminated and the roll and pitch indicator pointers must be in the middle positions: switch on the "WALL" switch on the panel panel in the front cabin. Turn the "RUDDER" pre-set unit knob 40° down, the indicator pointer on the panel must deflect "DOWN" approximately one division.

Press the "WALL" button. the "WALL" warning light on the bombardier control panel must come on and the "WALL" missile elevator must deflect $40 \pm 2^\circ$ down from the initial position. Measure the actual value of the elevator deflection angle.

Set the pre-set unit knob on the panel in the zero position.

Switch off and after 5-10 seconds switch on the "WALL" and "WALL" switch on the bombardier's control panel.

The "A.I. UNDOING" warning light must go out. The "BASES ZERO" warning light on the H-175 panel must be illuminated.

Repeat the calibration with the pre-set unit knob turned 3° , 4° , 6° "DOWN", and then "UP" for each value indicated by the pre-set unit; the elevator must respectively deflect "DOWN" or "UP" with a tolerance of $\pm 0.5^{\circ}$ for the value indicated by the pre-set unit.

NOTE: When calibrating the angles of 3° , 4° , 6° (unlike 1°) the "BASES ZERO" warning light must go out.

Calibrate the left suspension in the similar way.

Using the results of measurements make a calibration chart of the elevator deflection angles versus the position of the H-175 panel pre-set unit knob.

b) Check the elevator deflection angles caused by the H-175 panel signals as outlined in step 4a, this section with the pre-set unit knob turned 1° , 3° , 4° , 6° "UP" and "DOWN" according to the calibration chart.

In this case the difference between the actual values of the elevator deflection angles and values given in the calibration chart must not exceed 0.3° .

c) In flight the H-175 panel pre-set unit is set for a required mode by the carrier-aircraft crew in accordance with the "H-175 panel pre-set unit operating instructions".

d) Press the "UNDOING" button on the bombardier's control panel. The "A.I. UNDOING" warning light must come on.

Press the "B-1000 CLARE" button on the bombardier's panel and keep it pressed for 5-10 seconds. The "PITCH" indicator pointer on the H-175 panel must sharply deflect. After the

program is completed this pointer must return to the zero position.

e) Switch off and on the "A.P. and E-1" switch on the bombardier's control panel. The "ARM UNCAGED" light must go out. The "DANGER ZERO" warning light on the "E-1" panel must be illuminated.

5. Set the "SYSTEM POWER" and "A.P. and E-1" switches on the bombardier's control panel in the "OFF" position.

The "A.P. and E-1" "DANGER" warning lights on the bombardier's control panel and the "DANGER ZERO" on the panel must go out.

Set the "POWER" switch on the "E-1" control panel in the "OFF" position.

Disconnect the ground test control panel from plug connector No. 36.

6. Before a flight, set the "POWER" switch on the "E-1" control panel in the "ON" position and then close the access door.

program is completed this pointer must return to the zero position.

e) Switch OFF and on the "A-1" and "K-1" switch on the bombardier's control panel. The "UNCAGED" light must go out. The "BOMB ZERO" warning light on the "A-1/K-1" panel must be illuminated.

5. Set the "HYDRA PUMP" and "A-1" and "K-1" switches on the bombardier's control panel in the "OFF" position.

The "A-1" and "K-1" "SMALL" warning lights on the bombardier's control panel and the "BOMB ZERO" on the panel must go out.

Set the "POWER" switch on the "I-I" control panel in the "OFF" position.

Disconnect the ground test control panel from plug connector No.36.

6. Before flight, set the "POWER" switch on the "I-I" control panel in the "ON" position and then close the access door.

SECTION VI

AIR-5B AUTOPILOT PERIODIC MAINTENANCE OPERATIONS

19. AIR-5B AUTOPILOT PERIODIC MAINTENANCE OPERATIONS

PROCEDURES

1. The autopilot maintenance operations are periodic checks of the AIR-5B autopilot units condition which are performed to determine the autopilots serviceability for operation and further storage and also to prepare them so that they would meet the specifications.

2. The periodic maintenance operations are performed by the using organization mechanical personnel of the corresponding speciality.

The record of the periodic maintenance operations is made by the organization engineer or senior technician in the special log Book or certificates for the autopilot units and set.

NOTE: The form of the periodic maintenance operation log Book must correspond to the Aircraft Maintenance Manual.

3. The periodic maintenance operations are scheduled to the period of periodic inspections performed as outlined in paragraph 11, these Instructions.

10. PERIODIC MAINTENANCE OPERATIONS RECORD

| Nos. | Operations Performed | Devices, Tools, materials |
|------|--|---|
| 1. | <p>Visually inspect all the autopilot units. Make sure that the external surfaces of the units and mountings are free from damages. Remove dust and dirt from the units external surfaces.</p> <p>If corrosion is detected proceed as outlined in step 7, this paragraph.</p> <p>Remove the lower cover of the gyro unit and inspect the windings of the trimming rheostats on the unit mounting for condition. If corrosion (green coating) is found on the rheostat winding surface, proceed as specified in step 8, this paragraph.</p> | <p>Portable lamp, mirror, rags.</p> |
| 2. | <p>Disconnect the units plug connectors. Inspect the plug connector pins. If the pins contacting surfaces are dirty, clean them with a bristle brush slightly dampened with 1-70 gasoline and blow with compressed air at a pressure of 1-2 atm. Connect and safety the plug connectors.</p> | <p>1-70 gasoline, hair brush.</p> |

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| Nos. | Operations Performed | Devices, Tools, Mate- rials |
|------|---|--|
| 3. | <p>Remove the end cap from the HAY-11A rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, dip it with clean rags slightly dampened with M-70 gasoline and clean the commutator with 100 sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders.</p> <p>Close the inverter rear end housing assembly with the end cap.</p> | <p>Test kit M-70 gasoline. Rags "00" sand paper.</p> |
| 4. | <p>Perform the operations outlined in step 3 on the other HAY-11A inverter, incorporated in the autopilot set.</p> | |
| 5. | <p>Check the autopilot units and set as specified in:</p> <p>paragraph 12 - when storing the ALB-3B autopilot installed in the "KC" missile.</p> <p>paragraph 13 - when storing the ALB-3B autopilot with some units removed from the "KC" missile.</p> <p>paragraph 14 - when storing the ALB-3B autopilot in the packing cases.</p> | <p>Test In- struments set.</p> |

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| Nos. | Operations Performed | Devices, Tools, materials |
|------|---|--|
| 3. | <p>Remove the end cap from the IAF-11A rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with 1-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders.</p> <p>Close the inverter rear end housing assembly with the end cap.</p> | <p>Tool bit 1-70 gasoline. Rags "00" sand paper.</p> |
| 4. | <p>Perform the operations outlined in step 3 on the other IAF-11A inverter, incorporated in the autopilot set.</p> | |
| 5. | <p>Check the autopilot units and test as specified in:</p> <p>paragraph 12 - when storing the AII-5B autopilot installed in the "V" missile.</p> <p>paragraph 13 - when storing the AII-5B autopilot with some units removed from the "V" missile.</p> <p>paragraph 14 - when storing the AII-5B autopilot in the parking cradles.</p> | <p>Test instruments set.</p> |

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| Nos. | Operations Performed | Devices, Tools, Mate- rials |
|------|---|--|
| 3. | <p>Remove the end cap from the TAI-1A rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with 1-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 1/8 in. or less must be replaced with new ones. Install the brushes in the brush holders.</p> <p>Close the inverter rear end housing assembly with the end cap.</p> | <p>Test kit 1-70 gasoline. Rags "00" sand paper.</p> |
| 4. | <p>Perform the operations outlined in step 3 on the other TAI-1A inverter, incorporating in the autopilot set.</p> | |
| 5. | <p>Check the autopilot units and set as specified in:</p> <p>paragraph 12 - when storing the AIB-3B autopilot installed in the "40" missile.</p> <p>paragraph 13 - when storing the AIB-3B autopilot with some units removed from the "40" missile.</p> <p>paragraph 14 - when storing the AIB-3B autopilot in the packing cases.</p> | <p>Test in- struments set.</p> |

| Nos. | Operations Performed | Devices, Tools, materials |
|------|--|---|
| 3. | Remove the end cap from the HAP-10A rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with E-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders. | Tool kit E-70 gasoline. Rags "00" sand paper. |
| | Close the inverter rear end housing assembly with the end cap. | |
| 4. | Perform the operations outlined in step 3 on the other HAP-10A inverter, incorporated in the autopilot set. | |
| 5. | Check the autopilot units and set as specified in: paragraph 12 - when storing the AIM-5B autopilot installed in the "KC" missile. paragraph 13 - when storing the AIM-5B autopilot with some units removed from the "KC" missile. paragraph 14 - when storing the AIM-5B autopilot in the packing cases. | Test Instruments set. |

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| Nos. | Operations Performed | Devices, Tools, Mate- rials |
|------|--|--|
| 3. | Remove the end cap from the MAP-1GA rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with E-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders. | Tool kit E-70 gasoline. Rags "00" sand paper. |
| | Close the inverter rear end housing assembly with the end cap. | |
| 4. | Perform the operations outlined in step 3 on the other MAP-1GA inverter, incorporated in the autopilot set. | |
| 5. | Check the autopilot units and set as specified in: paragraph 12 - when storing the AHA-5B autopilot installed in the "KC" missile. paragraph 13 - when storing the AHA-5B autopilot with some units removed from the "KC" missile. paragraph 14 - when storing the AHA-5B autopilot in the packing cases. | Test In- struments set. |

| Nos. | Operations Performed | Devices, Tools, materials |
|------|---|--|
| 3. | <p>Remove the end cap from the HAF-1QA rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with E-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders.</p> <p>Close the inverter rear end housing assembly with the end cap.</p> | <p>Tool kit E-70 gasoline. Rags "00" sand paper.</p> |
| 4. | <p>Perform the operations outlined in step 3 on the other HAF-1QA inverter, incorporated in the autopilot set.</p> | |
| 5. | <p>Check the autopilot units and set as specified in:</p> <p>paragraph 12 - when storing the ANK-5B autopilot installed in the "KC" missile.</p> <p>paragraph 13 - when storing the ANK-5B autopilot with some units removed from the "KC" missile.</p> <p>paragraph 14 - when storing the ANK-5B autopilot in the packing cases.</p> | <p>Test Instruments Set.</p> |

Operations Performed

Devices,
Tools, mate-
rials

Remove the end cap from the HAP-10A rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface of the commutator. Wipe it with clean rag slightly dampened with 5-70 gasoline and clean the commutator with "00" sand paper. Measure the diameter brush length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders.

5-70 Gasoline
Rags "00" sand
paper

Close the inverter rear end housing assembly with the end cap.

4. Perform the operations outlined in step 3 on the other HAP-10A Inverter, incorporated in the autopilot set.

5. Check the autopilot units and set as specified in:

Test In-
struments
Set.

paragraph 12 - when storing the ANK-5B autopilot installed in the "KC" missile.

paragraph 13 - when storing the ANK-5B autopilot with some units removed from the "KC" missile.

paragraph 14 - when storing the ANK-5B autopilot in the packing cases.

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| Nos. | Operations Performed | Devices, Tools, materials |
|------|---|--|
| 3. | <p>Remove the end cap from the IAP-10A rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with E-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders.</p> <p>Close the inverter rear end housing assembly with the end cap.</p> | <p>Tool kit E-70 gasoline. Rags "00" sand paper.</p> |
| 4. | <p>Perform the operations outlined in step 3 on the other IAP-10A inverter, incorporated in the autopilot set.</p> | |
| 5. | <p>Check the autopilot units and set as specified in:</p> <p>paragraph 12 - when storing the AIR-5B autopilot installed in the "KC" missile.</p> <p>paragraph 13 - when storing the AIR-5B autopilot with some units removed from the "KC" missile.</p> <p>paragraph 14 - when storing the AIR-5B autopilot in the packing cases.</p> | <p>Test Instruments Set.</p> |

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| Nos. | Operations Performed | Devices, Tools, materials |
|------|---|--|
| 3. | <p>Remove the end cap from the HAP-14A rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with E-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders.</p> <p>Close the inverter rear end housing assembly with the end cap.</p> | <p>Tool kit E-70 gasoline. Rags "00" sand paper.</p> |
| 4. | <p>Perform the operations outlined in step 3 on the other HAP-14A inverter, incorporated in the autopilot set.</p> | |
| 5. | <p>Check the autopilot units and set as specified in:</p> <p>paragraph 12 - when storing the AIR-5B autopilot installed in the "KC" missile.</p> <p>paragraph 13 - when storing the AIR-5B autopilot with some units removed from the "KC" missile.</p> <p>paragraph 14 - when storing the AIR-5B autopilot in the packing cases.</p> | <p>Test Instruments Set.</p> |

| Nos. | Operations Performed | Technique, Tools, Materials |
|------|--|--|
| 3. | Remove the end cap from the HL-101 rear end housing assembly and turn out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, dip it into an aqueous solution of 10% gasoline and clean the commutator with fine sand paper. Then the distributor brushes should be checked to be in good condition. Brushes worn to 1/8 in. or less must be replaced with new ones. Inspect and adjust the brush holders. | HL-101 rear end housing assembly 10-70 gasoline sand paper |
| 4. | Perform the operations outlined in step 3 on the other HL-101. In case, in case of a burnt commutator, dip it into an aqueous solution of 10% gasoline and clean it with fine sand paper. | |
| 5. | Check the autopilot unit as outlined in paragraph 4 of the check sheet, the HL-101 autopilot unit in the HL-101. In case of a burnt commutator, dip it into an aqueous solution of 10% gasoline and clean it with fine sand paper. In case of a burnt commutator, dip it into an aqueous solution of 10% gasoline and clean it with fine sand paper. In case of a burnt commutator, dip it into an aqueous solution of 10% gasoline and clean it with fine sand paper. | |

Devices, Tools Materials

NOS.

1. *Phragmites australis* (Cav.) Trin. ex Steud.

Nos.

Operations Performed

Devices, Tools,
materials

rating surface by moving the slightly pressed chamois along the potentiometer winding turn. Clean two or three times, check the potentiometer cleanliness by means of a magnifying glass (24) having a four-fold enlargement; when cleaning, change dirty chamois.

c) wipe current-carrying plates (slivers) of the π - π and π - π units potentiometer by means slightly dampened with 70% alcohol.

By/1: When cleaning the potentiometer do not touch the brushes.

d) Clean the π - π units gear assemblies slip rings or followers:

a) manually, using the gear assembly, use one of the corresponding metal ring to the stop.

Wadding stick,
hair brush,
magnifying
glass 24.

b) carefully clean the slip ring surface by means of a sharp (0.5 mm wide) section of a stick made of thick wood (beech or bamboo preferable); check the surface for cleanliness by means of a magnifying glass having a four-fold enlargement;

| Nos. | Operations performed | Levers, pins, materials |
|------|----------------------|-------------------------|
|------|----------------------|-------------------------|

c) remove dirt on dust from the slip ring surface by brush near brush.

NOTE: When cleaning the slip rings, do not touch the brushes.

3. Clean the servo unit potentiometer as follows:

1) Move the potentiometer wiper to one of the extreme positions by rotating the unit collet shaft to rotate to the limit (stop).

2) With a cotton swab or a vision stick (No. 4 recommended) clean the contact slightly, especially with the wiper brush. The potentiometer operation surface is moving the silicon brush across the contact. The potentiometer winding wires.

3) After or three times checking, the potentiometer is adjusted by the wiper brush, and the wiper brush is cleaned, and the wiper brush is cleaned.

4) Clean the current-carrying plate (No. 4 recommended) with alcohol and clean with recommended alcohol.

NOTE: When cleaning the potentiometer, do not touch the wires.

5. Check the current-carrying plate and repeat the cleaning of the assembly as follows.

29

| Nos. | Operations Performed | Devices, Tools, Materials |
|------|---|--|
| | a) manually uncrack the [] assembly and move the inner and outer gimbal rings so that the large and small cam operating surfaces are clearly seen. | |
| | b) with a sharp end of a wooden stick (2-3 mm diam.) a strip of chamois slightly impregnated with rectified alcohol and wipe the cams, blade and tappet operating surfaces. | wooden stick, strip of chamois, rectified alcohol. |
| | c) perform the operations outlined in steps "a" and "b" on the [] assembly. | screwdriver, support, wooden stick, strip of |
| | d) unscrew 4 screws attaching the [] assembly. Unscrew 6 hex-head screws attaching the [] assembly. Slightly lift the [] assembly and remove the [] assembly. | chamois, rectified alcohol. |
| | Install the [] assembly in place. Install the [] assembly on the support (plate, 100x170x5 mm). | |
| | e) clean the [] assembly cams, blade and tappet as indicated in steps "a" and "b". | |
| | f) slightly lift the [] assembly, install the [] and then [] assembly in place and secure them by attaching screws placing split washers under the screw heads. | |

100

Nos.

Operations Performed

Locations, Tools,
Materials

Notes: When cleaning, do not touch
the rheostat or wires and
oil, finger brushes.

7. If corrosion is found on the outer surfaces
of the unit having metal or varnish coat-
ing, proceed as follows:

a) wipe the area subjected to corrosion Cotton cloth,
with a clean cloth slightly dampened with gasoline
or kerosene. Hair brush.

b) remove corrosion products by hair
brush.

c) wipe the treated area with a clean
cloth.

d) wipe the treated area with a clean
cloth.

e) wipe the treated area with a clean
cloth.

f) wipe the treated area with a clean
cloth.

8. If corrosion is detected on the surface
of the rheostat, rheostat winding,
proceed as follows:

a) if corrosion is not considerable,
use the following: pull on a sharp end of
a wooden stick (3-4 cm. wide) a strip
of emery cloth, dampened with kerosene
gasoline and wipe the rheostat winding
surface leaving the slightly polished
surface along the rheostat winding.

Notes.

101

Nos.

Operations Performed

Devices, Tools,
materials

b) replace the rheostat, if
corrosion cannot be removed completely.

NOTES:

1. It is also permitted to perform the operations outlined in step 1, when performing every month maintenance operations on the missile.
2. After accomplishing the operations described in paragraphs 15, 16, the 1-3 and 3-4 units must be closed with the covers and secured with seals of the using organization. The manufacturer's guarantee will remain valid.

SECTION VII

A1A-5B AUTOPILOT TEST EQUIPMENT

21. A1A-5B AUTOPILOT TEST EQUIPMENT

1. The A1A-5B autopilot combined checkout in the "RSC" missile with the H-1 gyro unit removed from the missile and also the autopilot checkout on the test stand is performed by means of the test equipment set.

2. Check the A1A-5B autopilot installed in the "RSC" missile by means of the PHK ground test control panel.

3. The set of the test equipment (cwg.379.00.00.000) incorporates:

| | | |
|-------------------|---------------|----------|
| PHK-1 | control panel | - 1 |
| PHK-2 | mounting | - 1 |
| PHK-3 | simulator | - 3 |
| PHK-4 | junction box | - 3 |
| PHK-5 | turn table | - 1 |
| Connecting cables | | - 1 set. |

NOTE: When checking the A1A-5B autopilot installed in the missile, the PHK-3 simulators and PHK-4 junction boxes are not used.

The test equipment set is shown in Fig.12.

PHK-1 control panel (cwg.379.00.00.000) is a variable pressure sensor. The PHK-2 simulators are respectively 0.1, 0.2 and 0.3 kg. The PHK-3 simulators are not more than 0.5 kg.

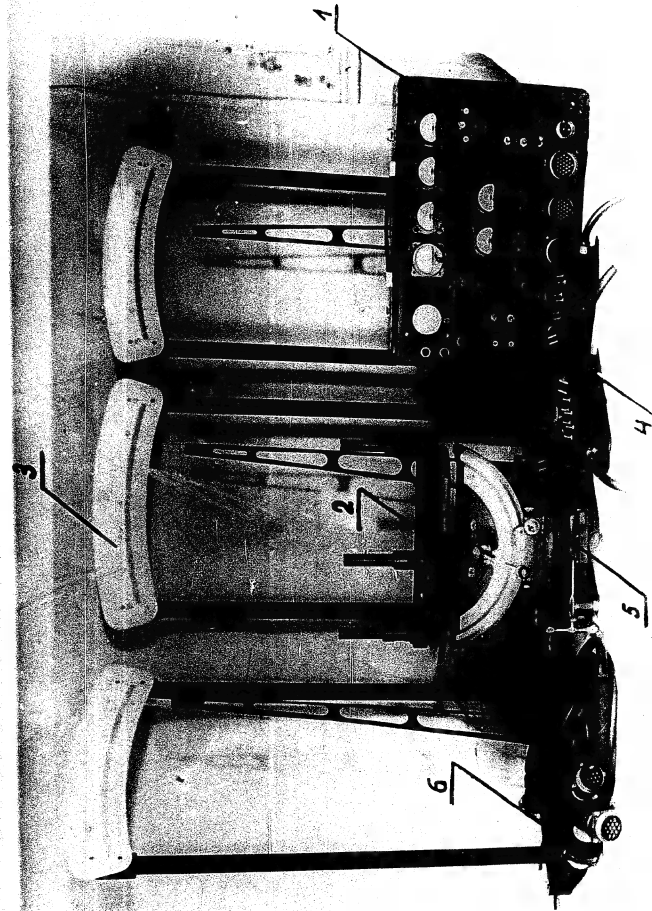


Fig. 12. Test Equipment Set.

- 1. - KIA-1 control panel; 2 - KIA-2 mounting; 3 - KIA-5 turn table; 4 - KIA-4 junction box;
- 5 - KIA-3 simulator; 6 - connecting cables; 7 - KIA-2 mounting.

Shock-mounted to the control panel casing is the face panel carrying all the control panel electrical units and the clock showing the time during which the autopilot is energized. The clock is started by a special electromagnetic relay built-in the control panel which is actuated whenever the autopilot is energized.

The autopilot supplies D.C. power of 26 V to plug connector No.43 to feed the control panel circuits. The panel is provided with a special "POWER SELECTOR SWITCH" used to change the modes of the control panel functioning; with the "POWER SELECTOR SWITCH" in the "BOARD CHECK" position, the autopilot is checked via the board check plug connector, and with the switch in the "K-17M SIMULATOR" position, the autopilot check is simulated by means of the K-17M panel of the carrier-aircraft and with the switch in the "K-1M SIMULATOR" position a combined operation of the autopilot and K-1M station is simulated.

The KHA-1 control panel schematic diagram is given in Fig.13.

The control panel operating temperature range:

- a) control panel with test instruments model HMC and HM-70 (dwg.3790100000) - 20°C to $+50^{\circ}\text{C}$.
- b) control panel with test instruments model MS-2 (dwg. 3370000000) - 35°C to $+50^{\circ}\text{C}$.

NOTE: When operating at a temperature below zero do not use the clock of the panel (dwg.37901.00.000); when operating the panel (dwg.3370000000) close the "CLOCK HEAT" switch.

KHA-2 mounting (dwg. 3790200000) is intended for attaching the IL-2 gyro unit to the KHA-5 turn table. The IL-2 gyro unit is secured on three steel posts screwed in the mounting base. The mounting attachment holes are displaced from the line of symmetry to shift the C.G. position of the IL-2 gyro unit together with the mounting from the turn table axis of rotation when attaching the unit to the turn table.

This shift is made to prevent the turn table plays from affecting the accuracy of the turning angles measurement. The mounting weight is not more than 8.5 kg.

KHA-3 simulators (dwg. 379.03.00.000) are designed to indicate the IL-4 servo units outlet shafts turning angles when checking the autopilot on the stand.

The simulator scale is graduated from 0 to $\pm 15^\circ$. Each degree division is divided into 10 parts i.e. the scale division value is equal to 6 minutes of arc. The angles are indicated by the pointer attached to the outlet shaft of the IL-4 servo unit to be checked. The simulator weight is not more than 7.2 kg.

KHA-4 junction boxes (dwg. 379.04.00.000) are connected to the autopilot circuit when checking the autopilot on the stand to permit switching-on and checking of the IL-4 servo units various control circuits. The junction box weight does not exceed 1 kg. The junction box schematic diagram is given in Fig. 14.

KHA-5 turn table (dwg. 379.05.00.000) is designed to set the IL-2 gyro unit angle of turn about 3 mutually perpendicular axes. Angles of the table turn (see Fig. 15):

The above mentioned parameters of the turn table are insured in operation by careful handling and periodic maintenance operations performed as follows:

- a) once a month thoroughly wipe (without disassembling) the frictional surfaces of the lower and upper semi-cylinders with a clean cloth or rags and then cover them with a light coating of OK-12-7 lubricant;
- b) adjust the angular play by means of eccentric bearings and locking screws.

The turn table weight is not more than 21 kg.

Connecting cables (dwg. 379.06.00.000) are intended to connect the autopilot units when checking the autopilot on the stand and to connect the II-L gyro unit, removed from the missile, to the missile wiring system and KHA-I control panel when checking the autopilot in the missile.

Incorporated in the test equipment set are 12 connecting cables and KHA-I control panel power supply cable.

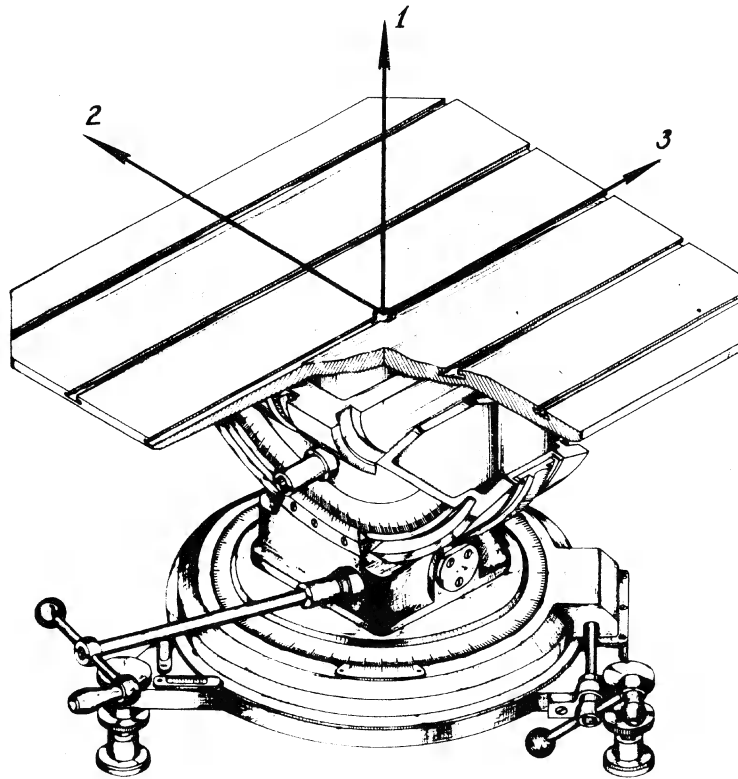


Fig. 15. KIA-5 Turn Table (see Diagram).

The Ground Test Control Panel (GTC) (Fig. 16, No. 00.000) is a portable panel with dimensions 645x465. The panel dimensions are 645x465 (from 1957) and 602x352x702 (after 1957).

The panel weight is not more than 1 kg. mounted in the panel using the same panel covers. It is electrical units.

The autopilot control panel is connected through plug connector No. 12 to the autopilot control panel plug connector to feed the test panel circuit.

The test panel schematic diagram is given in Fig. 17.

Furnished with the ground test control panel and connecting cables to connect it to the autopilot control panel plug connector and wiring harness plug connector No. 12 (to simulate a combined operation of the autopilot and K-12 station).

The test panel operation temperature ranges:

- a) panel with test instruments type TTS... -20°C to +50°C.
- b) panel with test instruments type TTS... -25°C to +50°C.

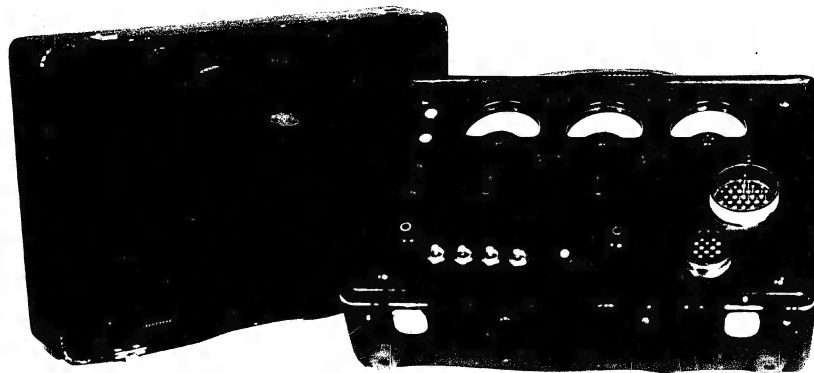


Fig. 16. GTC Ground Test Control Panel

The GROUND TEST CONTROL PANEL (GTC-17) (00.000) is a portable metal case construction (Fig. 16). The panel dimensions are 343x252x115 (front panel before 1957) and 302x252x92 (after 1957).

The panel weight is not more than 1 kg. Located inside the panel casing is the main panel wiring and the electrical units.

The autopilot amplifier is connected through plug connector No. 42 to the autopilot test bench plug connector to feed the test panel amplifier.

The test panel automatic amplifier is powered by 110V.

Furnished with the ground test control panel are connecting cables to connect it to the autopilot amplifier plug connector and specially wiring ground plug connector No. 12 (to simulate a combined operation of an autopilot and T-1W station).

The test panel operating temperature range:

- a) panel with test instruments type T-1W... -20°C to +50°C.
- b) panel with test instruments type T-1W... -25°C to +50°C.

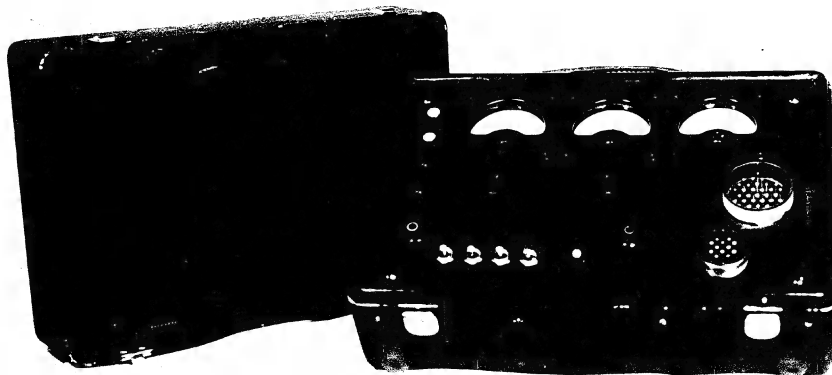
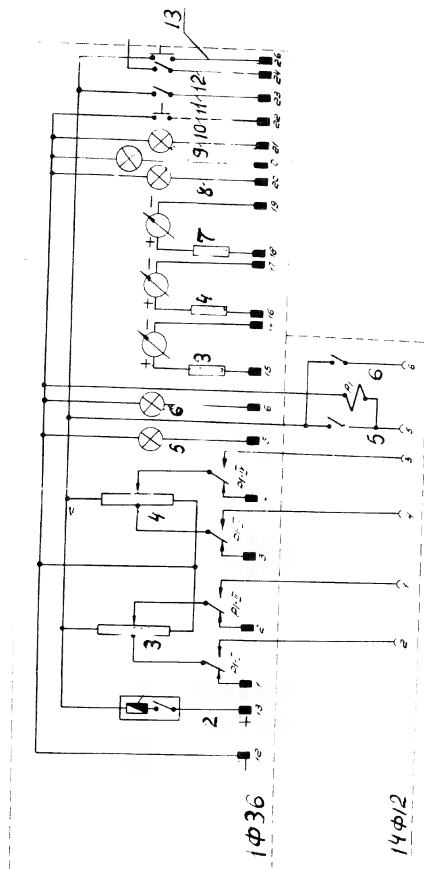


Fig. 16. GTC-17 Ground Test Control Panel



- 1) Board check 2) Power 3) Yaw 4) Ditch 5) Command No. 1 6) Command No. 2
 7) Roll 8) Base zero 9) Caged 10) Unlatching 11) Check 12) Emergency
 13) 11-18 MD Start 14) 11-18 MD unit simulator
 15) Control surfaces position indicators (1-0-1MA)

Fig. 16. 11A Ground Test Control Panel

12. The following are the operating instructions for the

1. When starting, set the following values on the

2. The following are the operating instructions for the

3. When starting, set the following values on the

4. The following are the operating instructions for the

5. The following are the operating instructions for the

6. The following are the operating instructions for the

7. The following are the operating instructions for the

8. The panel is used to set the following values:

9. The following are the operating instructions for the

10. The following are the operating instructions for the

11. The following are the operating instructions for the

12. The following are the operating instructions for the

13. The following are the operating instructions for the

14. The following are the operating instructions for the

15. The following are the operating instructions for the

16. The following are the operating instructions for the

17. The following are the operating instructions for the

113

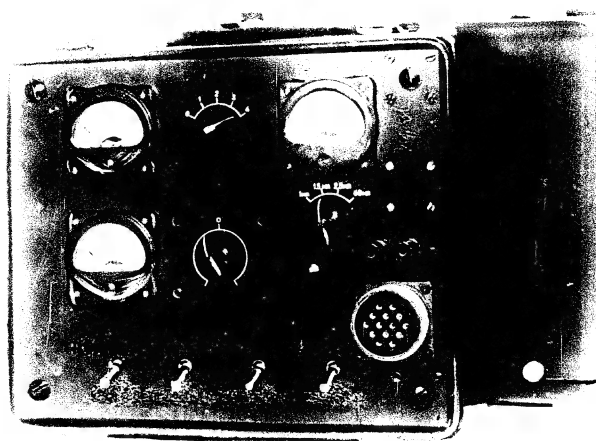
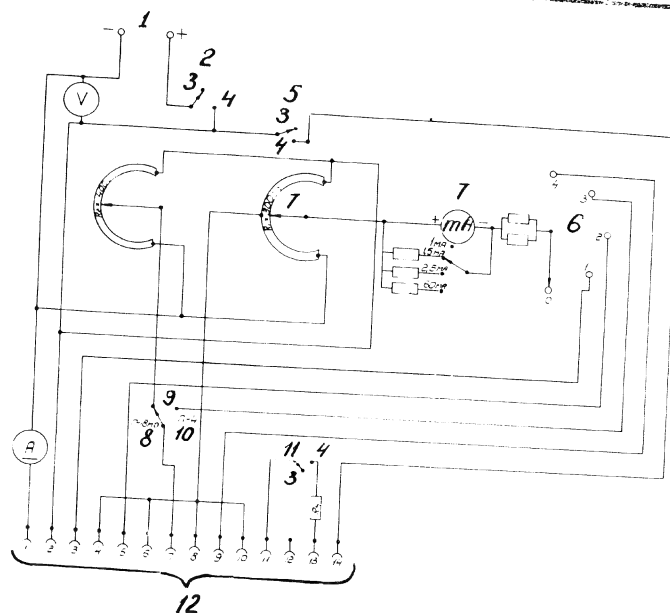


Fig. 18. KI-1 Control Panel



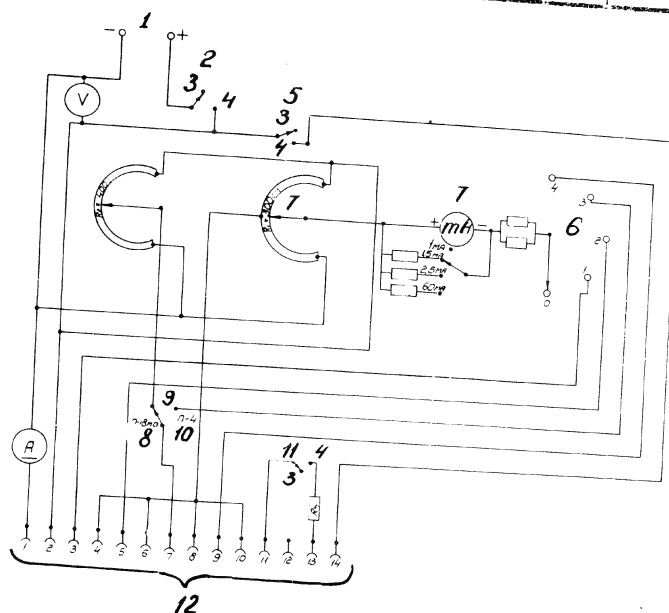
- 1) Power 26 V. 2) Power.
- 3) Off 4) On 5) IT-18MO start
- 6) Winding selector switch
- 7) Signal. 8) IT-18MO timer
- 9) Panel. 10) IT-4 Servo unit
- 11) Feedback. 12) Receptacle
- 13) Key to diagram

A - D.C. ammeter with the scale range of 0-10 A,
2.5 degree of precision

V - D.C. voltmeter with the scale range of 0-30 V,
3.5 degree of precision

MA - milliammeter model MS-2 with the scale range
of 1-0-1 with μ_1, μ_2, μ_3 shunts connected, the
scales are respectively 15-0-15; 2.5-0-2.5, 60-0-60.

Fig. 19. IT-1 control panel schematic diagram.

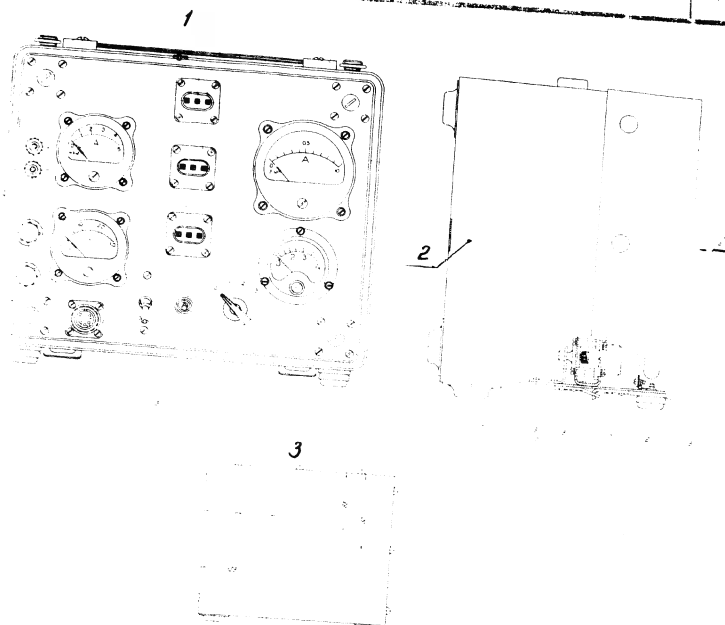


- 1) Power 26 V.
- 2) Power.
- 3) Off
- 4) On
- 5) 17-18MO start
- 6) Winding selector switch
- 7) Signal.
- 8) 17-18MO timer.
- 9) Panel.
- 10) 17-4 Servo unit
- 11) Feedback.
- 12) Receptacle.
- 13) Key to diagram

A-D.C. ammeter with the scale range of 0-10 A,
2.5 degree of precision
V-D.C. voltmeter with the scale range of 0-30 V,
3.5 degree of precision
MA-milliammeter model M5-2 with the scale range
of 1-0-1 with $\omega_1, \omega_2, \omega_3$ shunts connected, the
scales are respectively 1.5-0-1.5, 2.5-0-2.5, 60-0-60.

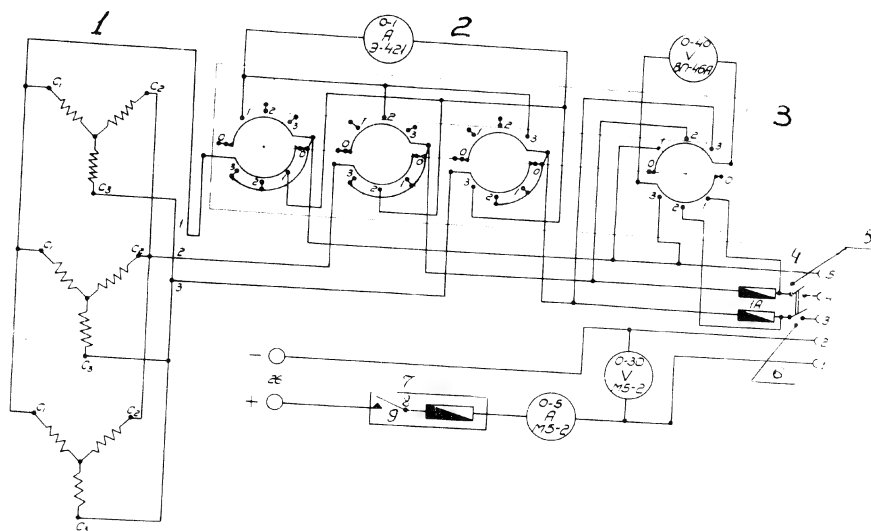
Fig.12. MH-I Control Panel (Same as Fig.11)

115



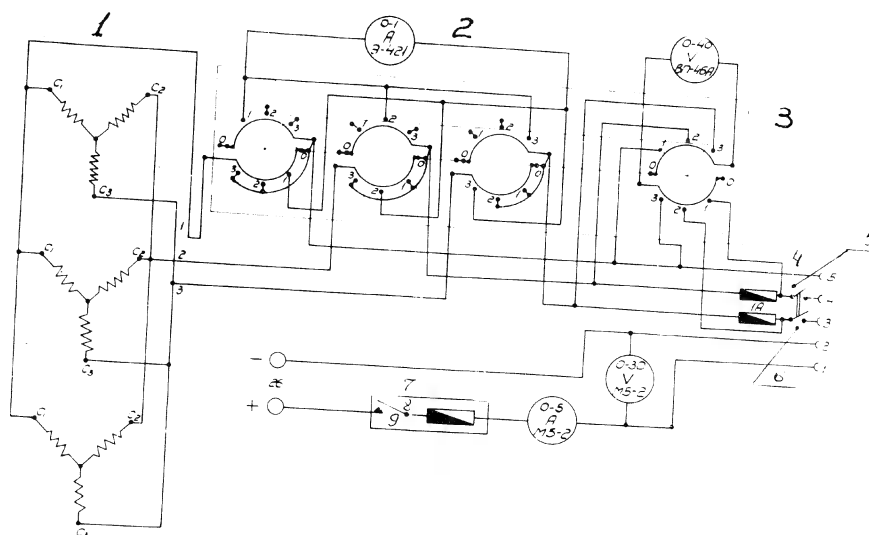
- 1) View without protective cover (5) and cover (2)
- 2) Inspection Department stamp here
- 3) View on arrow A, Scale 1:2

Fig. 20. KIL-5 Control Panel

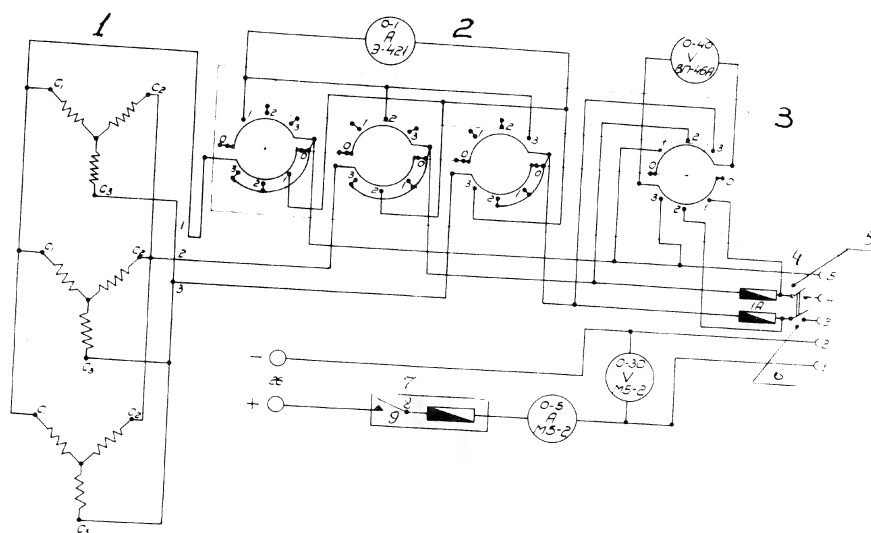


- 1) Gyromotors No. 489 00 04 000
- 2) Phase selector switch
- 3) Selector 24 kch 578H
- 4) Load
- 5) Off
- 6) On
- 7) Power
- 8) Off
- 9) On

Fig. 21. Control circuit of the gyromotors.

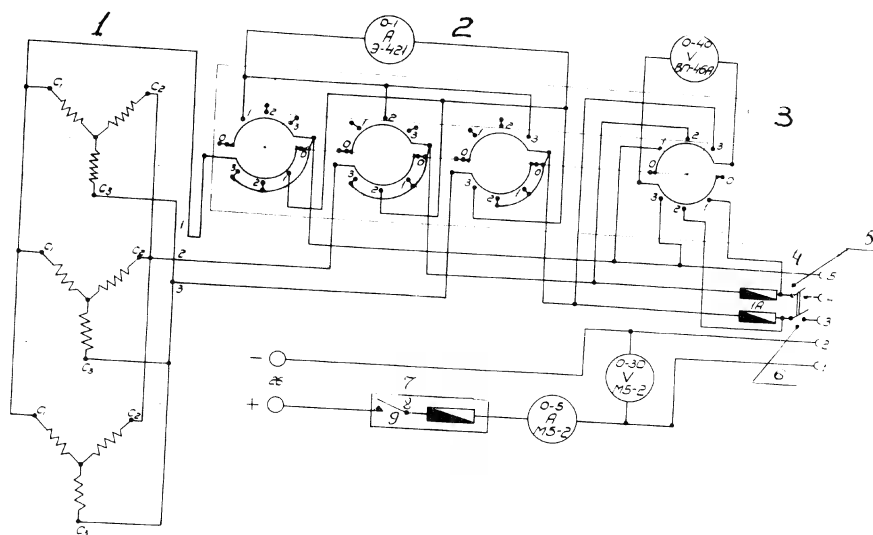


- 1) Gyromotors No 489 00 04 000
- 2) Phase selector switch
- 3) Selector 24 Kc 508H
- 4) Load
- 5) Off
- 6) On
- 7) Power
- 8) Off
- 9) On

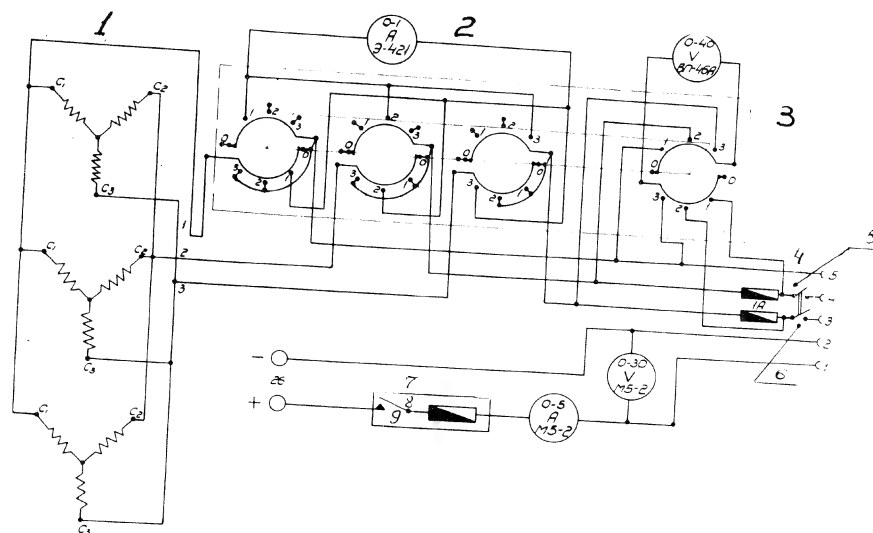


- 1) Gyromotors No. 489 00 0-000
- 2) Phase selector switch
- 3) Selector switch 5788
- 4) Load
- 5) Off
- 6) On
- 7) Power
- 8) Off
- 9) On

Fig. 21. 1-1 1000-2 1000-1 1000-1 1000-1

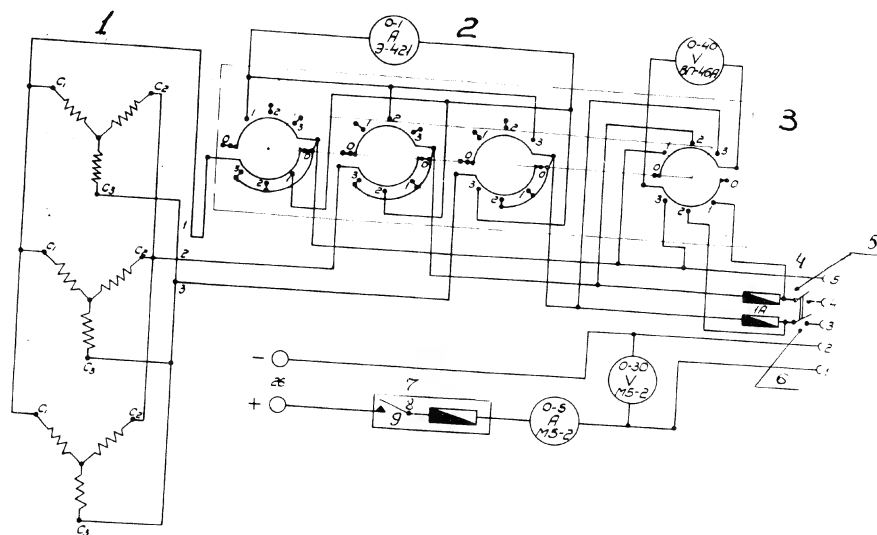


- 1) Gyromotors No 489 00 04 000
- 2) Phase selector switch
- 3) Selector switch 578H
- 4) Load
- 5) Off
- 6) On
- 7) power
- 8) Off
- 9) On



- 1) Gyromotors No.489 00 04 000
- 2) Phase selector switch
- 3) Selector switch 578H
- 4) Load
- 5) Off
- 6) On
- 7) Power
- 8) Off
- 9) On

Fig. 21. Control circuit of the gyromotors.



- 1) Gyromotors No.489 00.04.000
- 2) Phase selector switch
- 3) Selector switch 578H
- 4) Load
- 5) Off
- 6) On
- 7) Power
- 8) Off
- 9) On

Fig.21. KI-5 Control Panel Schematic Diagram.



1. KRYPTHO

2. N



4. 10/1/61

5. 10/1/61

6. 10/1/61

7. 10/1/61

8. 10/1/61



2 14

SECRET

1. The purpose of this document is to provide information on the activities of the [redacted] in the [redacted] region.
2. The [redacted] has been active in the [redacted] region since [redacted].
3. The [redacted] has been active in the [redacted] region since [redacted].
4. The [redacted] has been active in the [redacted] region since [redacted].
5. The [redacted] has been active in the [redacted] region since [redacted].
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21. The [redacted] has been active in the [redacted] region since [redacted].
22. The [redacted] has been active in the [redacted] region since [redacted].

14

1. The external functioning of the unit

1.1. General description

The unit is a self-contained electronic device which is provided for the recording of the information transmitted by the transmitter of a radio link in the following manner:

a) when the transmitter is in the "stand-by" state, the unit is in the "stand-by" state; when the transmitter is in the "transmission" state, the unit is in the "recording" state.

b) the unit is capable of recording the information transmitted by the transmitter in the "stand-by" state.

c) the unit is capable of recording the information transmitted by the transmitter in the "transmission" state.

2. The unit is intended for use in the field

2.1. General description

a) when working in the "stand-by" state, the unit is capable of recording the information transmitted by the transmitter in the "stand-by" state; when the transmitter is in the "transmission" state, the unit is in the "recording" state.

b) the "recording" state of the device, i.e. there is an interval between the moment of A.G.C. output voltage disappearance and the moment of initiating the self-destructing command, this interval is equal to 0 ± 2 sec.

c) setting of the A.G.C. output voltage level for the self-destructing command within $-1V \pm -0.5V$.

4 14

2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 2682, 2683, 26

B. Unit directed: 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994,

The unit "C-140-1A" is a relay device, which gives away the execution command (+27 v) for missile "KC" self-destroying to the autopilot elevation driver when the Radar A-regime A.G.C. output voltage is less than a preestablished value. The A.G.C. goes through the plug-connection "III -20" pin N 5. When missile "KC" guidance is normal beam-riding, the A.G.C. output voltage, applied to the balanced network, cutoff the unit from

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| Ф. И. О. | | | | | | | | | |

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The missile-borne power supply #27 also goes through the closed relay P-3 contacts to the intermediate relay P-4, which de-energizes the control relay P-3, and with it disconnects the unit from the control circuit of the

- 6 -

Per. Inet 6 Inet 4

autopilot elevation driver. If the missile "XC" goes out from the K-11A beam, the A.G.C. voltage starts decreasing.

When it becomes less than a level necessary to hold the relay closed in its position, the +130 v is disconnected from the "memory" circuit capacitor C1.

The capacitor C1 starts discharging across the resistor R4 and the relay P1 windings and some time later the relay P1 opens its contacts and switches off the +130 v from the relay P4 winding. With this the relay winding winding will be closed and the +130 v network voltage will be applied to the winding of the relay P5, which interlocks and gives away a control voltage +25 v through the plug III-21 at the relay P4 driver network.

The potentiometer R9 and the resistor R10 form the voltage divider of the +25 v network. The potentiometer R9 serves for selecting the relay P1 releasing, moment, when A.G.C. voltage level at the tube A2 control grid is constant.

The relay P2 provides the unit "GO" self-destructing command in the case, when the unit K1-58P A.G.C. detector tube 5J-43 is defective. When this fact takes place the unit K1-58P gives away a voltage approximately equal to -25 v + -30 v, the relay opens its contacts N 2 and N 3, +130 v is disconnected from the "memory" circuit and it will produce self-destructing command.

The resistor R6 is patched so, that the relay P2 operates, when the plug III-20 pin N 5 voltage is equal to 20 v \pm 2v.

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The resistor R5 limits current flowing in the circuit driver relay winding. The jack "P-I" provides monitoring of relay P-I releasing in checking the unit sensitivity.

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| | | | | | взм. | | | | | | |

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Date: Aug 8 1964

II. The unit operational instruction

1. General

When the unit "CJ-10-12" is used it is necessary to:

- a) Set a necessary operating sensitivity of the unit.
- b) Install the unit into the slot "X" and check its efficiency.
- c) Check the unit efficiency, which several checking on the ground and in the air.

2. Installation of the unit operational instructions

to make connections in the following

Procedure

- a) after checking and setting the Panel 2-12 and the autopilot, do not switch off the equipment 2-1303; disconnect the cable 2-11 from the board 2-119 and connect it to the unit "CJ-10-12";
- b) connect the g.e. voltmeter (class 2.5 and scale range: 0 - 100 v) to the jack "P-I" and to the ground;
- c) switch on the board 2-11, set an "X" input signal power equal to -45 dbm;
- d) turn the unit "CJ-10-12" potentiometer R9 knob "sensitivity" clockwise as far as it will go; when it will be done, the voltmeter must indicate voltage at the jack "P-I";
- e) turn slowly the potentiometer R9 knob counter-clockwise until the jack "P-I" voltage disappears;
- f) increase the signal power up to -45 dbm; voltage must appear at the jack "P-I" in this case;

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e) release the button "KOL, N I";

g) Decrease the input signal down to -45 dBm; wait the duration 100.0 \pm 1 sec; later the unit must produce the 45dB signal.

the rear "D" hatch opening conveniently
and it be checked before every flight inclu-
ding the "D" handle.

The main "WALL" efficiently checking is to be carried out jointly with the complete system checking on the ground, in the air and before laying on fighting course by the leadership crew.

a) the unit is to be checked after overall complete system checking;

b) when the Nadans K-III and K-III are switched on ~~and~~ and the Autopilot is caught, the navigator-bombaimer should push the board "EK-17M" button "command N I" and order "Attention! Switch off high voltage!" to the navigator-operator.

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| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

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11/11/11

c) measure time interval between the Radar 3-IIM transmitter switching off and the moment of the unit "G/10-1A" dive signal appearance. When the unit is operating normally, the pointer of the board "KL-17M" elevator indicator must deviate to the left at 2 ± 1 division in 6 ± 2 sec after the moment of the Radar 3-IIM transmitter switching off.

d) release the battery connector M 3, the indicator pointer must move to the right at 2 ± 1 division.

Verifying a simultaneous dive of the unit "G/10-1A" and the unit "G/10-1B" is performed the following way:

5. Requirements for storage and packing

1. the units "G/10-1A" are allowed to be stored:

a) in the object "K" in accordance with the object "K" storage instructions;

b) in separate units on shelves in the rooms, which are specially equipped.

Requirements: Storage rooms must be ventilated (temperature, within $+5^{\circ} + +30^{\circ}$, relative humidity no more than 80 percent). Storage of all units together with acids, alkalies and poisonous substances is prohibited.

2. All the units must be packed, using board boxes (drawing N B П-4-180-015). Boxes, containing units, should be protected with a polychlorovinyl cover and stored in a packing case (drawing N B Р-39-00) in fours in each case.

Копия документа передана на хранение в архив

Ф. 11/11

- 12 -

Лист 12

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6. Transportation of the units

I. The units are allowed to be transported in the above-mentioned packing.

a) by truck:

- max. distance 500 km at a speed no more than 30 km/hour (natural road) and at a speed of 40 km/hour (highway).

b) by rail, by water and by air:

- any distance.

7. Regulation works

I. Regulation works include:

a) superficial examination,

b) electrical parameter checking.

2. When the units C AKC-1A are installed in the objects "KC", the regulation works are to be carried out simultaneously with the regulation works of the object "KC".

3. When the units C KC-1A are stored in storehouses the regulation works must be carried out monthly.

8. Manufacturer's guarantee

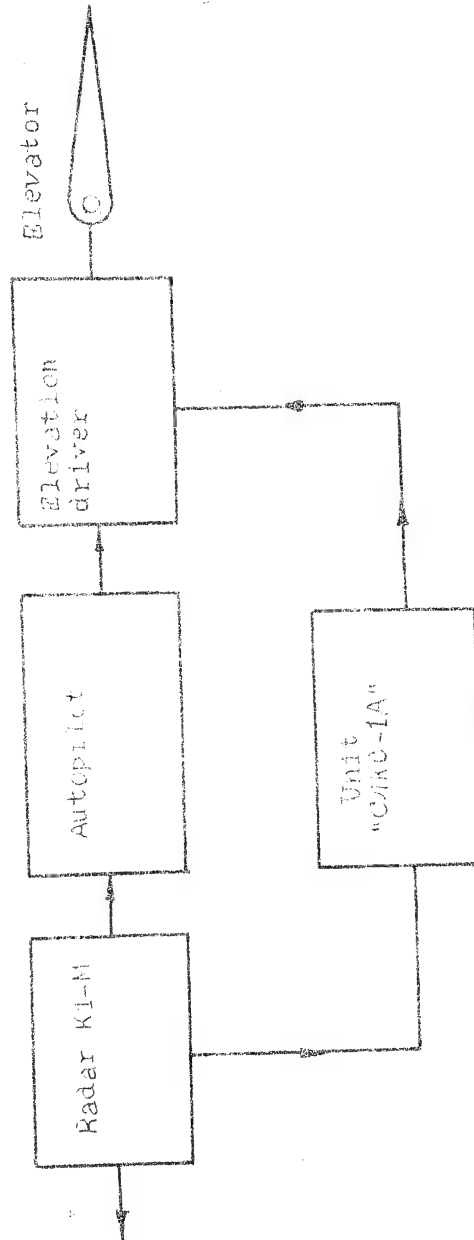
The manufacturer guarantees 1000 operational cycles during 12 months from the date of arrival in the port of destination.

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| Ф. XVa | | | | | | | | | | | |

13

Ред. 1 Инст 13 Инст 4

Appendix N 1



The "C/AC-1A" connection diagram

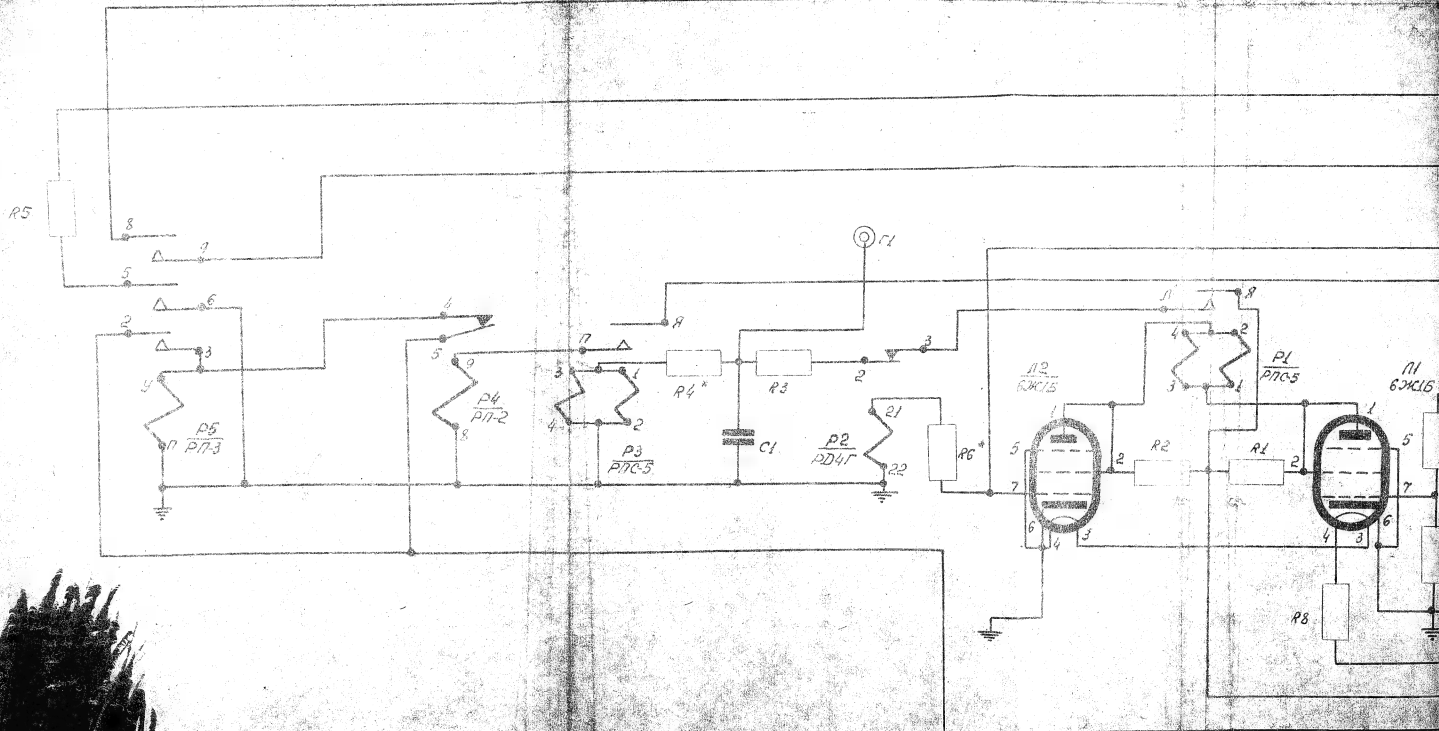
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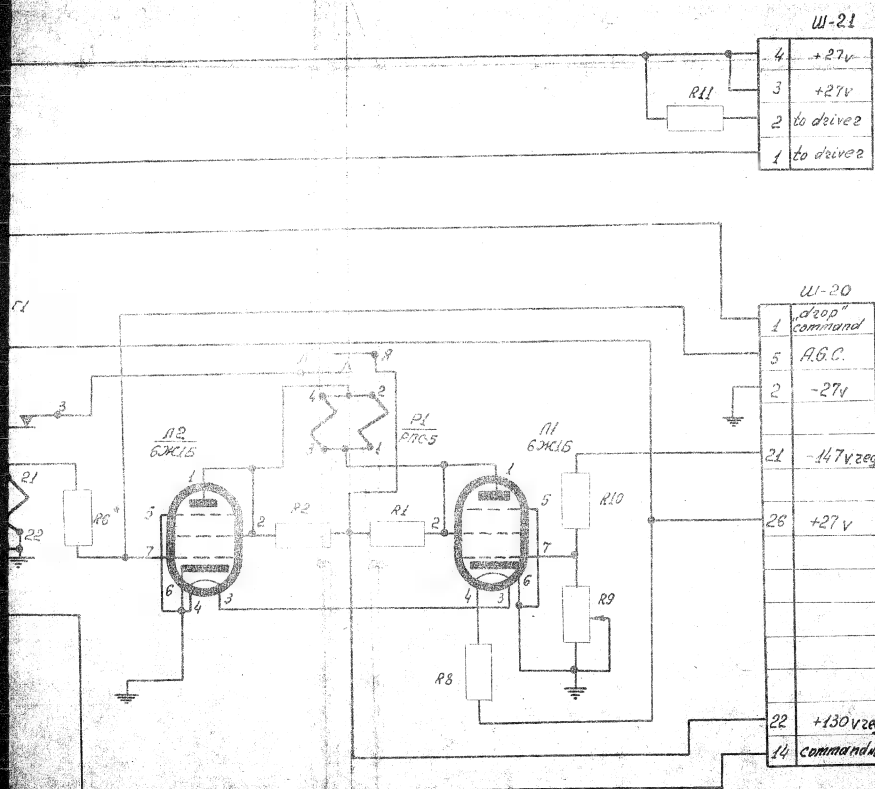
| | | | |
|-----------------------------|-------------|--|--|
| tube 6Ж15 | | | |
| tube 6Ж15 | | | |
| resistor MPT-1-100000-II | 100 Kohm | | |
| resistor MPT-1-100000-II | 100 Kohm | | |
| resistor MPT-05-6800-II | 6,8 Kohm | | |
| resistor MPT-1-68000-II | 51-91 Kohm | | |
| resistor ПЭВ-10-240M-10% | 24 ohm | | |
| resistor MPT-05-6800-II | 6,8-12 Kohm | | |
| resistor ПЭВ-10-750M-10% | 75 ohm | | |
| resistor ППЗ-11-1000 OM | 1000 ohm | | |
| resistor ПТ-1-30K ± 1% | 30 Kohm | | |
| resistor MPT-2-180-II | 180 ohm | | |
| relay PNC-5 | | | |
| relay PNC-5 | | | |
| relay PD4Г | | | |
| relay ПП-2 | | | |
| relay ПП-3 | | | |
| socket WP20N43Г8 | | | |
| socket WP48326Г. W2 | | | |
| monitoring jack | | | |
| capacitor K50-2-200-6-25-II | 25 MF | | |
| name and mark | | | |

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The unit "CANC-1A"
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diagram

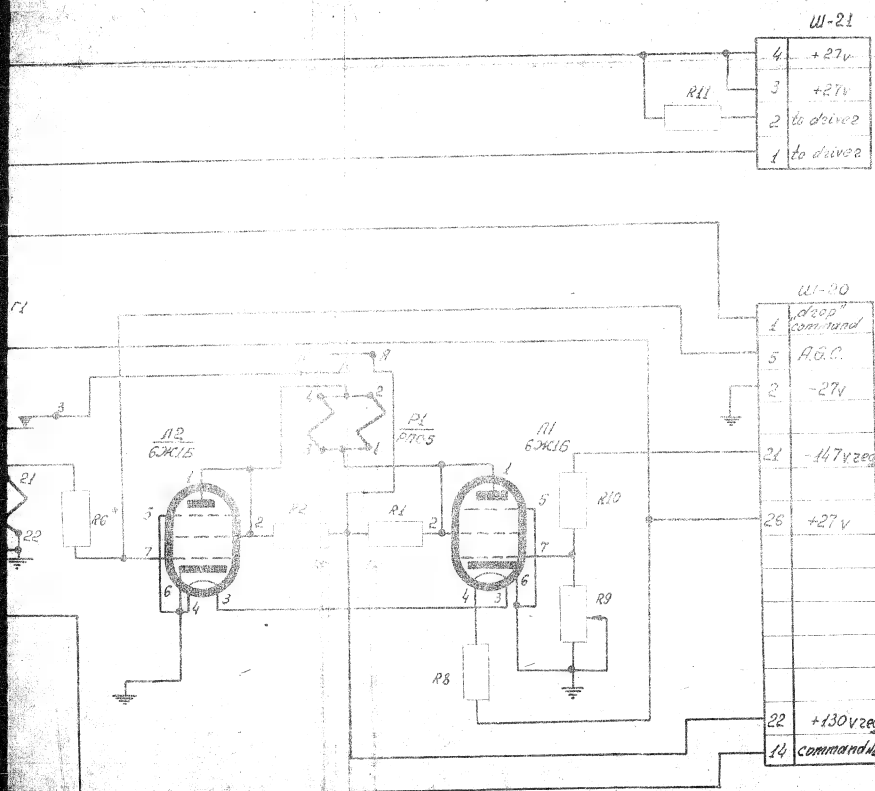


Appendix 12



| | | | | | |
|--------|-----------------------------|-----------|--|--|--|
| N1 | tube 6X15 | | | | |
| N2 | tube 6X15 | | | | |
| R1 | resistor MIT-1-100000-1 | 100 K ohm | | | |
| R2 | resistor MIT-1-100000-1 | 100 K ohm | | | |
| R3 | resistor MIT-25-6800-1 | 6.8 K ohm | | | |
| R4 | resistor MIT-1-51000-1 | 51 K ohm | | | |
| R5 | resistor 1198-10-24 ohm-100 | 24 ohm | | | |
| R6 | resistor MIT-25-6800-1 | 6.8 K ohm | | | |
| R7 | resistor 1198-10-75 ohm-100 | 75 ohm | | | |
| R8 | resistor 1113-11-1000 ohm | 1000 ohm | | | |
| R9 | resistor MIT-1-30K-1% | 30 K ohm | | | |
| R10 | resistor MIT-2-180-1 | 180 ohm | | | |
| P1 | relay PNC-5 | | | | |
| P2 | relay PNC-5 | | | | |
| P3 | relay PNC-5 | | | | |
| P4 | relay PNC-2 | | | | |
| P5 | relay PNC-3 | | | | |
| W-21 | socket WPB04978 | | | | |
| W-20 | socket WP48326742 | | | | |
| C1 | monitoring jack | | | | |
| C1 | capacitor 161-2-206-25 | 25 nF | | | |
| Symbol | name and mark | | | | |

Appendix #2



| | | | | | |
|--------|----------------------------|-------------|--|--|--|
| N1 | tube 6X15 | | | | |
| N2 | tube 6X15 | | | | |
| R1 | resistor MIT-1-10000-Ω | 100 Kohm | | | |
| R2 | resistor MIT-1-10000-Ω | 100 Kohm | | | |
| R3 | resistor MIT-05-6800-Ω | 6.8 Kohm | | | |
| R4 | resistor MIT-1-68000-Ω | 51-91 Kohm | | | |
| R5 | resistor IT9B-10-240m-10% | 24 ohm | | | |
| R6 | resistor MIT-05-6800-Ω | 6.8-12 Kohm | | | |
| R7 | resistor IT9B-10-75m-10% | 75 ohm | | | |
| R8 | resistor IT9B-11-1000 ohm | 1000 ohm | | | |
| R9 | resistor IT-1-30Ω ± 1% | 30 Kohm | | | |
| R10 | resistor MIT-2-180-Ω | 180 ohm | | | |
| R11 | resistor MIT-2-180-Ω | 180 ohm | | | |
| P1 | relay PNC-5 | | | | |
| P2 | relay PNC-5 | | | | |
| P3 | relay PDC-7 | | | | |
| P4 | relay PNC-2 | | | | |
| P5 | relay PNC-3 | | | | |
| W-21 | socket WIP20043r8 | | | | |
| W-20 | socket WIP483267w2 | | | | |
| C1 | monitoring jack | | | | |
| C1 | capacitor K511-2-200-6-25% | 25 μF | | | |
| Symbol | name and mark | | | | |

The unit CIRC-14
elementary
diagram

Appendix #2.

W-21

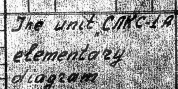
| | |
|---|-----------|
| 4 | +27v |
| 3 | +27v |
| 2 | to device |
| 1 | to device |

W-20

| | |
|----|--------------|
| 1 | deep command |
| 5 | A.G.C. |
| 2 | -27v |
| 21 | 47v zener |
| 25 | +27v |
| 22 | +130v zener |
| 14 | command |

| | |
|--------|-------------------------------------|
| A1 | tube 6X15 |
| A2 | tube 6X15 |
| R1 | resistor MIT-1-10000-Ω 100 Kohm |
| R2 | resistor MIT-1-10000-Ω 100 Kohm |
| R3 | resistor MIT-05-6800-Ω 6.8 Kohm |
| R4 | resistor MIT-1-6800-Ω 6.8 Kohm |
| R5 | resistor IT9B-10-240Ω-10% 24 ohm |
| R6 | resistor MIT-45-6800-Ω 6.8 Kohm |
| R8 | resistor IT9B-10-75Ω-10% 75 ohm |
| R9 | resistor IT9B-11-1000Ω-10% 1000 ohm |
| R10 | resistor MIT-1-30Ω ± 1% 30 Kohm |
| R11 | resistor MIT-2-180-Ω 180 ohm |
| P1 | relay PNC-5 |
| P2 | relay PNC-5 |
| P3 | relay PNC-5 |
| P4 | relay PNC-2 |
| P5 | relay PNC-3 |
| W-21 | socket WIP2004378 |
| W-20 | socket WIP483267.142 |
| F1 | monitoring jack |
| C1 | capacitor K50-2-200-6-25V 25μF |
| Symbol | name and mark |

The unit CIRC-1A
elementary
diagram



| | | |
|--------|---------------------------------|-------------|
| R1 | tube 6X15 | |
| R2 | tube 6X15 | |
| R3 | resistor MPT-1-10000- \bar{I} | 100 ohm |
| R4 | resistor MPT-1-10000- \bar{I} | 100 Kohm |
| R5 | resistor MPT-45-6800- \bar{I} | 6,8 Kohm |
| R6 | resistor MPT-1-81000- \bar{I} | 51-91 Kohm |
| R7 | resistor 1198-10-240m-10% | 24 ohm |
| R8 | resistor MPT-45-6800- \bar{I} | 6,8-12 Kohm |
| R9 | resistor 1198-10-750m-10% | 75 ohm |
| R10 | resistor 1173-11-1000 ohm | 1000 ohm |
| R11 | resistor MPT-1-30k $\pm 1\%$ | 30 Kohm |
| P1 | resistor MPT-2-180- \bar{I} | 180 ohm |
| P2 | relay PNC-5 | |
| P3 | relay PNC-5 | |
| P4 | relay PD4T | |
| P5 | relay P11-2 | |
| W-21 | relay P11-2 | |
| W-20 | socket WP2014378 | |
| G1 | socket WP483267412 | |
| G1 | monitoring jack | |
| C1 | capacitor K50-2-200-6-25% | 25 nF |
| Symbol | name and mark | |

**INVERTER MODEL ПАГ-1ΦА
DESCRIPTION**

1

INVERTER MODEL HAI-10A

DESCRIPTION

7

INVERTER, MODEL HAT-10A

DESCRIPTION

I. GENERAL

The HAT-10A inverter is designed for feeding special units with a three-phase 400 c.p.s. A.C. and represents a unit consisting of a D.C. motor with compound field winding and a three-phase A.C. generator excited by a rotor permanent magnet.

The inverter is provided with a special filter (see the diagram) used for suppressing the inverter radio-noise, the filter consists of three interlocking and one duct capacitors and a choke.

The inverter is connected to the missile electrical system by means of a five-pin plug connector.

The inverter is provided with a built-in adjusting resistor connected in the electric motor shunt winding circuit for maintaining the generator frequency and voltage constant at different ratings.

II. TECHNICAL DATA

A. FOR THE ELECTRIC MOTOR

1. Terminal voltage $27 \pm 10\%$ V
2. Current drawn not more than 3.5 A
3. No-load current at supply
voltage of 27 V not more than 2.2 A

4. Speed of rotation $8000 \pm 10\%$ r.p.m.
5. Duty continuous
6. R.H. direction of rotation
(as viewed from the commutator end)

B. FOR THE GENERATOR:

7. Voltage 36 ± 4 V
8. Output current not more than 0.51 A
9. Power factor 0.65
10. Frequency $400 \pm 10\%$ c.p.s.

C. MTC-7 BRUSHES ("7" - a specific Mfr's Mark)

11. Size $6.5 \times 7 \times 14$ mm.
12. Quantity 2
13. Tension on brushes 225 ± 25 gr

D. MAGNETO-TYPE BALLBEARINGS No. 6007... 2

- E. Weight not more than 3.5 kg.

III. INVERTER ELECTRICAL SYSTEM

The inverter wiring schematic diagram is given in Fig.1.

IV. DESIGN

The inverter is provided with a fan-assisted cooling (Fig.2).

The iron laminations of the electric motor and generator stators are mounted in a common casing (1), cast integral with a support.

The electric motor armature and generator are mounted on a common shaft (2). The electric motor magnet system

rotor

is two-pole. The electric motor field coils windings (3) are connected in series.

The end of the series field winding is connected to the positive brush-holder.

The end of the shunt field winding is connected to the regulated adjusting resistor (12) located in the support.

The negative brush-holder wire is directly connected to the plug connector, and the common field winding end-to the plug connector (Fig.1) via the duct capacitor and the choke mounted on the end housing assembly (4).

The generator stator winding ends and electric motor filter wires are connected to the plug connector (6) through the holes in the end housing assembly.

The inverter plug connector pins designation corresponds to those in the schematic diagram (Fig.1).

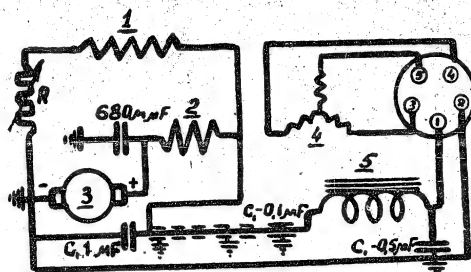
The adjusting resistor (12) mounted in the support is designed for adjusting the A.C. frequency with the inverter operating at a nominal load.

The position of the adjusting resistor slider in the electric motor shunt winding circuit is set at the Mfr's plant and is unchangeable during operation.

Mounted in the support beside the resistor, is the capacitor (11) connected in the filter circuit. The generator rotor is a permanent magnet made in the form of a six-pointed star.

Brushes are inserted in brass brush-holders mounted on the brush-holders bracket (7) which can be turned for adjustment purpose.

Two openings in the end housing assembly (5) covered with



- 1 Shunt.
- 2 Series.
- 3 Armature.
- 4 Generator.
- 5 Choke

Fig.1. Inverter Wiring Schematic Diagram

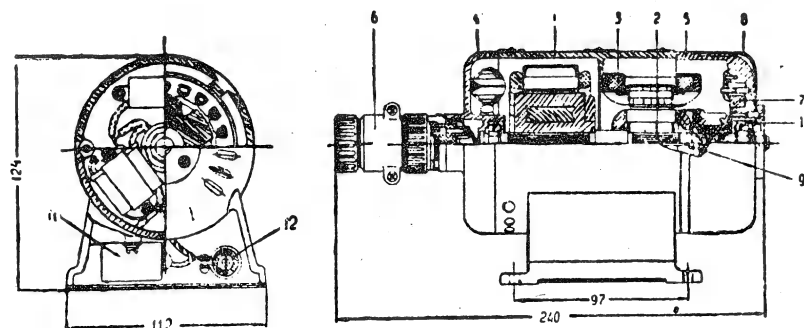


Fig.2. Inverter Cross-Section View

- 1 - Casing; 2 - shaft; 3 - field coil; 4 - end housing assembly; 5 - end housing assembly; 6 - plug connector;
- 7 - brush-holders bracket; 8 - end cap; 9 - stud; 10 - ball-bearing; 11 - capacitor; 12 - resistor.

the end cap (8) permit to inspect brushes with the end cap removed.

The end housing assemblies made of aluminium alloy are attached to the casing by two studs (9).

The armature is mounted on the magneto-type ball-bearings (10) which facilitate the inverter assembly and disassembly. The armature end play is compensated by four cylindrical springs producing an axial pressure on the ball-bearing outer race, from the commutator end.

V. INVERTER DISASSEMBLY AND RE-ASSEMBLY PROCEDURE

After the guaranteed service life has expired, disassemble the inverter when a trouble detected can't be remedied without disassembling the inverter and when it is necessary to replenish the ball-bearings lubricant.

If the generator rotor magnet was removed from the stator assembly it must be magnetized and stabilized at the Mfr's plant. The armature should not be removed from the inverter if unnecessary.

Disassemble the inverter as follows:

- a) Remove the end cap from the end housing assembly;
- b) Disconnect the brushes and pull them out of the brush-holders;
- c) Disconnect the field winding end from the brush-holder and disconnect the wire leading from the brush-holder to the plug connector;
- d) Release the studs;

e) Disconnect the plug connector from the end housing assembly and unsolder the wires from the receptacle pins;

f) Remove the end housing assembly (5) from the casing; move the end housing assembly (4) 20-30 mm. away from the casing, unsolder the wires from the capacitors and choke, and remove the end housing assembly;

g) Pull the armature ^{out} of the casing from the generator end.

When pulling the armature out of the casing, tightly enclose the rotor in a steel tube to prevent the permanent magnet demagnetizing.

Re-assemble the inverter reversing the disassembly procedure. In this case do the following:

a) Before re-assembling the inverter, wash the ball-bearings with clean gasoline. Pack the bearings with a limited quantity of UNATIM-201 lubricant; apply the lubricant only to one side of the ball-bearing so that the lubricant would be flush with the bearing ball;

b) Insert the brushes into the brush-holders only after the inverter re-assembly is completed to prevent them from being damaged by the commutator butt.

Pay particular attention to proper fitness of the brushes to the commutator surface. Otherwise, fit the brushes to the commutator by using sandpaper 220 (ГОСТ 3647-47).

If the commutator is burnt, wipe it with a clean cloth slightly dampened with gasoline. Clean the commutator with sandpaper 220 (ГОСТ 3647-47).

c) Lock all attachment parts in the same way as they were locked before disassembly.

After the inverter reassembly is completed, check the armature for free rotation turning it by hand.

When rotating, the armature must not contact the poles and the commutator-the brush-holders.

Stiff or unsmooth rotation of the armature may result from misalignments due to a poor re-assembly.

The inverter insulation is tested:

a) on the motor side - by applying 330 volts D.C. for 10 sec. in this case the electrical circuit must be disconnected from the casing by raising the negative brush and B9B-25K-85-II resistor clamp;

Apply the test voltage as follows:

one pole - to the inverter casing, the other - to the plug connector contact "1";

b) On the generator end - by applying 500 volts A.C. for 1 min.

Connect the terminals of the power supply source as follows:

one - to the casing, the other - to one of the plug connector contacts "3", "4", "5".

Check the insulation resistance by using a corresponding megohmmeter, connecting its terminals in the same way as they were connected when the insulation was tested.

In both cases the insulation resistance must be not less than 5 megohms.

VI. INVERTER INSTALLATION AND OPERATION INSTRUCTIONS

1. The inverter is installed in horizontal position, and attached by screws inserted through the support holes.

2. The inverter is designed for direct connection to the missile electrical system without any starting relays.

3. After the inverter is connected to the missile electrical system, fully tighten the plug connector coupling nut.

4. During the inverter service, periodically check its brushes and commutator for condition.

At normal operation the operating surface of the commutator is brown and not burnt.

If the commutator is burnt, clean the commutator as outlined in Section V.

Brushes worn by 10 mm. long or less must be replaced with the new ones of the same type.

The a.c. wires must be twisted inside the inverter and shielding conduits.

5. The inverter operates at:

a) Altitude above sea level.....up to 15000 m.

b) Ambient air temperature from -60°C to $+50^{\circ}\text{C}$.

c) Relative humidity up to 98%.

**INVERTER MODEL ΠΑΓ-ΙΦΑ
DESCRIPTION**

**ILLUSTRATED LIST
FOR SPI 11**

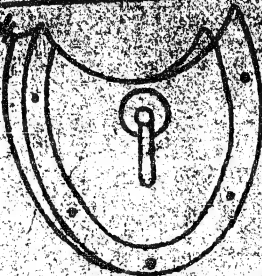
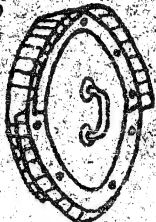



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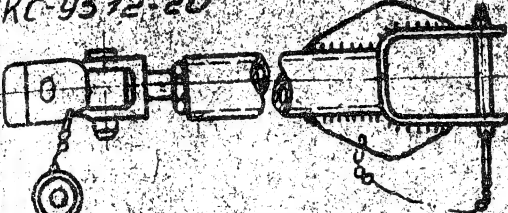

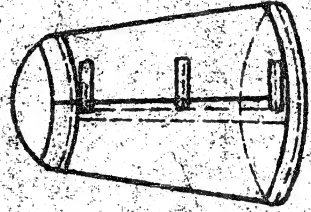
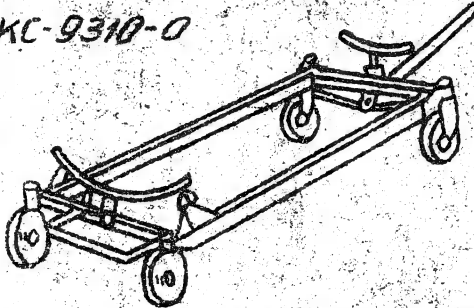
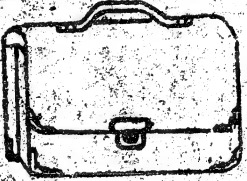

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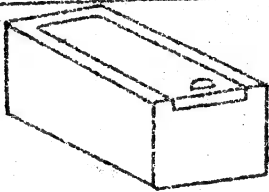



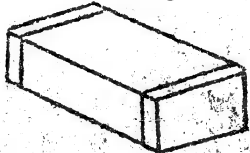

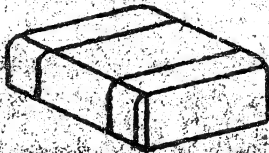

FOR GROUND EQUIPMENT
AND INDIVIDUAL SET


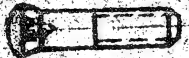

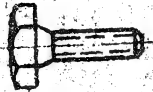
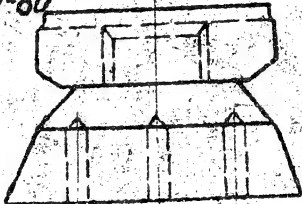
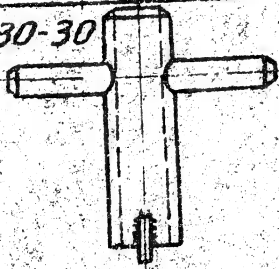
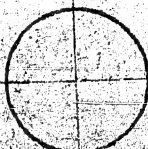

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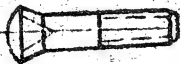
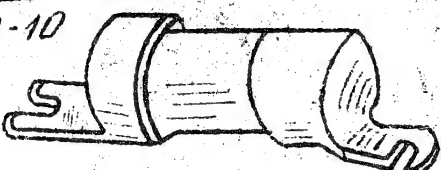

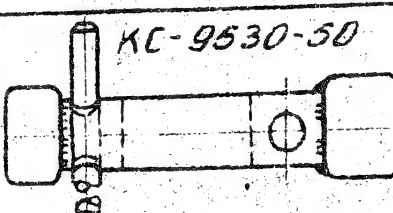
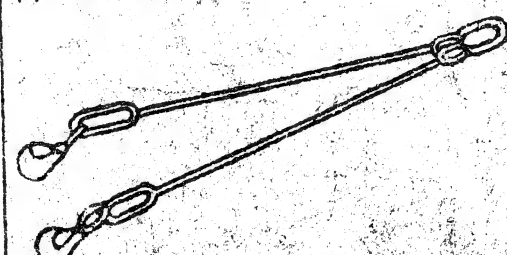

AIRCRAFT

| Detail and equipment No | Case No | Name |
|---|---------|------------------------------------|
| 08K/04  | | Front shield. 1 in set. |
| 08K/015  | | Rear shield. 1 in set. |
| KC-9710-D  | Item. | Fuselage front 4 in set. |
|  | | Fuselage end. 1 in set. |
| KC-7106-1110  | 1-1 | Cradle bonding strip. 2 in set. |

| Detail and equipment No | Case No | Name |
|---|--------------------|--|
| KC-9512-20  | Installed on item. | Wing rod-support 2 in set |
| 08KC/054A  | | Cover for preservation of item KC 1 in set |
|  | 1-1 | Cover for front and rear cover of engine 2 in set |
| KC-9310-0  | | Hangar trolley 1 in set |
| Аpmukyn 4043  | | Documentation bag 1 in set |
| MA-500M  | 1-1 | Converter spare parts 1 set |

| Detail and equipment No | Case No | Name |
|---|---------|---|
| 4A-250M  | 1-1 | Spare parts for convertor. 1 set. |
| K1-M  | 1-1 | Spare parts for each radar station. 1 set. |
| KP-1  | 1-1 | Starting coil spare parts. 1 set. |
|  | 1-1 | Electrical actuator. 1 set. |
| 630613  | 1-1 | Stopvalve gaskets. 2 in set. |
|  | 1-1 | Spare brush. 4 in set. |
| K1-3-0-002  | 1-1 | Wave guide section gasket 5 in set. |
|  | 1-1 | Brushes for electrical actuator. 2 in set. |
|  | 1-1 | Spare parts for generator. 1 set. |

| Detail and equipment No | Case No | Name |
|---|---------|--|
| | | Illustrated List ground equipment 1 set |
|  | 1-1 | P.C.V. Bag for cradle attachment bolts. 1 in set |
| 155H555-5-16-14  | 1-1 | Bolt for hatch attachment 20 in set |
| 15A49-6  | 1-1 | Spring washer 4 in set. |
| KC-7106-102  | 1-1 | Cradle attachment bolts. 2 in set. |
| KC-1800-80  | 1-1 | Nut for wing attachment 4 in set. |
| KC-9530-30  | 1-1 | Key for wing attachment. Supplied with each 2 item KC. 1 in set. |
| KC-7901-3056x   | 1-1 | Washer for wing pickups. 2 in set |

| Detail and equipment No | Case No | Name |
|--|---------|---|
| 291C50-2-19-150  | 1-1 | Spring for wing attachment. 2 in set. |
| 155H555-6-16-12  | 1-1 | Bolt for hatch attachment. 50 in set. |
| 117-10  | 1-1 | Delayed action fuse. 2 in set. |
| KC-6100-18  | 1-1 | Ring gasket for KC-6100-140 valve ring. 5 in set. |
| KC-9530-50  | 1-1 | Key for cradle rigid mount. Bolts supplied with each 3 in set. item KC |
| KC-8400-110  | 1-1 | Safety-bar extractors. 1 set |
| KC-6100-202  | 1-1 | Gasket for stop valve. 1 in kit. |

Inspector

SUPPLEMENT TO INSTRUCTION No. 369-W3

I N S T R U C T I O N S

FOR CHECKING REFERENCE INSTRUMENTS ON PANELS

OF 369 ITEM TEST EQUIPMENT

I. INTRODUCTION

This instruction is to be adhered to, when checking the reference instruments on the ~~JIA-369~~ test equipment panels during their service and storage within the guaranteed service life. The checks are performed together with the periodic maintenance operations in accordance with this instruction.

II. GENERAL

The tests are to be carried out under the following conditions:

- a) at an ambient air temperature of $+20^{\circ}\pm 5^{\circ}\text{C}$;
- b) at an air pressure equal to the atmospheric pressure in the place of the test;
- c) at a relative air humidity of 30 to 80 per cent;
- d) the reference instruments should have valid certificates which certify their serviceability.

III. PERIODIC MAINTENANCE OPERATIONS IN SERVICE AND STORAGE

The periodic maintenance operations consist in checking the test panels and are performed to determine their serviceability or possibility of their further storage and also to bring them into conformity with the specifications, if necessary.

The periodic maintenance operations are performed by the technicians of the using organization or the Mfr's plant. Entries about the periodic maintenance operations performed are made in a special book by the engineer or chief technician of the organization.

The periodic maintenance operations are performed in the following manner and sequence.

After every 2 months:

1. Inspect all the plug connectors of the connecting cables for damage and corrosion, and remove dust and dirt from them. If corrosion signs are found on the pins, wash the pins with a brush dampened in alcohol and wipe with a cloth.

2. Remove the covers from the MIA-I, MI-I, MI-5, MEX test panels, inspect the outer surfaces of the panels, instrument panels and plug connectors for damage, panels for proper attachment and shock mounting.

Wipe the outer surfaces with a cloth to remove dust and moisture.

If the plug connector contacts are dirty or affected by corrosion, wash and wipe them clean as described in para. 1 of this instruction.

3. Check the knobs for attachment and tighten those loose.

4. If in operation of the MI-I test panel an unsmooth movement of the "Signal" milliammeter pointer occur due to a

dirty potentiometer, remove the panel and wipe the potentiometer with a chamois cloth slightly dampened in rectified alcohol.

- NOTE: a) Carry out the above described operations immediately after a defect is detected during the panel operation irrespective of the time the periodic maintenance operations are to be performed.
- b) When installing the panel on shock mounts, seal the panel with sealing compound by filling the sealing cup with the compound and place the cup under the panel attachment screw.

5. Check the panel electric instruments for accurate readings, taking into consideration that the test equipment for the 360 item is manufactured in the following two versions:

- 1) with reference instruments ensuring operation of the test equipment panels within the temperature range of -35° to $+50^{\circ}\text{C}$ (M5-2, 3-42I, BU-4C).
- 2) with reference instruments ensuring operation of the test panels within the temperature range of -20° to $+50^{\circ}\text{C}$ (HMT-70, DMC, HMT-70, BU-4C).

Given below are permissible errors of the reference instruments for both versions of the test equipment. Therefore, when checking an instrument, refer to the tolerances for the type of the instrument whose error is to be checked.

Checking the Reference Instruments of AIA-I Test Panel

1. Check the operation of the control surfaces position indicators on the AIA-I test panel as follows:

- a) supply 26 V.D.C. to the 43/12(-)-43/13(+) pins;
- b) set the "PANEL POWER SUPPLY" switch to the "BOARD CHECK";
- c) supply 26 V.D.C. via a 20 kohms resistor to the 15-14, 16-17, 18-19 pins of plug connector No.43 in turn with the polarity indicated in table No.1.

In this case the indicator pointers should move to the right.

Table No.1.

| Supplied voltage polarity | | Indicator | Direction of indicator pointer deflection |
|---------------------------|----|-------------|---|
| + | - | | |
| 15 | 14 | "Direction" | to the right |
| 16 | 17 | "Pitch" | to the right |
| 18 | 19 | "Bank" | to the right |

Change the polarity of the supplied voltage; in this case the indicator pointers should move to the left.

2. Check the reading error of the panel power supply voltmeter by connecting to the 43/12-43/13 pins a d.c. reference voltmeter (0.5 degree of precision with the scale graduated from 0 to 30 V).

Difference in the readings of the two voltmeters should not exceed:

0.9 V - for the M5-2 voltmeter,

0.6 V - for the M5-10 voltmeter.

3. Check the control signal indicators for reading errors.

For this purpose connect a d.c. reference milliammeter (0.5 degree of precision with a 1-0-1 mA scale to the 43/1-43/2 pins. Perform the check with the "PANEL POWER SUPPLY" switch in the "BOARD CHECK" position and the K_1 and K_2 buttons pressed. Turning the knobs of the signal preset units to both sides, compare the readings of the reference milliammeter and the control signal indicators at the scale points 0; 0.2; 0.4; 0.6; 0.8; 1. Difference in their readings, should not exceed:

0.04 mA for the ILC milliammeter,

0.06 mA for the M5-2 milliammeter.

Checking the Reference Instruments of ILC Test Panel

Test the control surface position indicators for proper functioning.

Supply 26 volts via a 20 kohms resistor in turn to the 14-15, 16-17, 18-19 pins of plug connector No.36 with the polarity indicated in table No.2. In this case the indicator pointers should move to the right.

Table No.2

| Indicator | Polarity of voltage supplied to pins of plug connector No.36 | | Direction of indicator pointer deflection |
|-------------|--|----|---|
| | + | - | |
| "Direction" | 15 | 14 | to the right |
| "Pitch" | 16 | 17 | to the right |
| "Bank" | 18 | 19 | to the right |

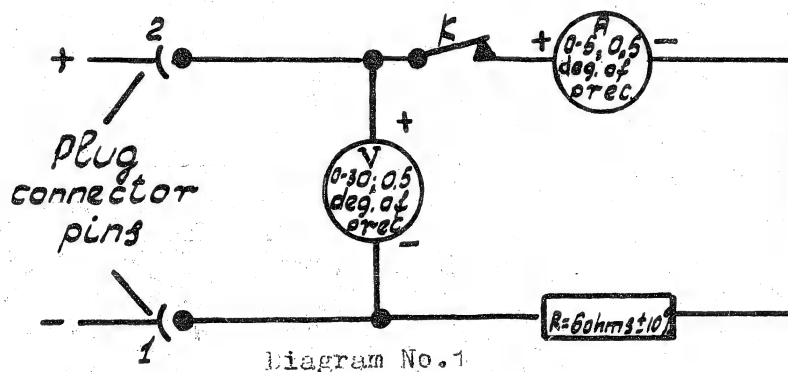
Change the supplied voltage polarity; this done, the indicator pointers should move to the left.

Checking the Reference Instruments of M-1 Test

Panel

1. To check the supply voltmeter reading error, proceed as follows:

- a) Supply +26 volts to the "+" terminal, and -26 volts to the "-" terminal of the panel;
- b) connect a reference voltmeter (0.5 degree of precision) and ammeter (0.5 deg. of precision) to the 1-2 sockets of the plug connector according to the following diagram:



c) switch on the "PANEL POWER SUPPLY" switch; in this case the pointers of all the voltmeters and ammeters should move to the right, and the difference in their readings should not exceed:

- 0.9 V for the M5-2 voltmeters
- 0.6 V for the IM-70 voltmeters
- 0.28 A for the M5-2 ammeters
- 0.18A for the IM-70 ammeters.

NOTE: To take the voltmeter readings, open the ammeter circuit by the switch K.

2. To check the "SIGNAL" milliammeter reading errors proceed as follows:

- a) to the 3-4 plug connector sockets connect in series the reference milliammeter of 0.5 degree of precision with a 0-3 scale and the resistor of 100 ohms $\pm 10\%$;
- b) set the "PANEL" switch to the H-4 position;
- c) set the "POWER SUPPLY" switch to the "ON" position;
- d) set the "WINDING" selector switch to the "1" position, and the "SIGNAL" switch to the "1mA" position. Turn the "SIGNAL" preset unit knob on the panel clockwise, and compare the readings (on the points, marked with figures) of the panel milliammeter with those of the reference milliammeter. Difference in their readings should not exceed 0.07 mA.
- e) change the polarity of the reference milliammeter connected and make a similar check, with the "SIGNAL" preset unit knob turned counterclockwise;
- f) make a similar check, with the "Signal" switch in the "1.5 mA" and "2.5 mA" positions.

With the switch in those positions, the readings of the "Signal" milliammeter and the reference milliammeter should not differ in more than 0.09 mA and 0.14 mA respectively.

NOTE: For the KIL-1 test panel whose "SIGNAL" milliammeter of IM-70 type has a "3-0-3" mA scale, the check is performed in a similar manner; difference between the readings of the milliammeters in this case must not exceed 0.11 mA.

Checking the Reference Instruments of MIL-5 Test Panel

1. Check the power supply circuit voltmeter readings for error:

a) supply +26 volts to the "+26 V" terminal, and -26 volts to the "-26 V" terminal of the panel;

b) connect a reference voltmeter (0.5 degree of precision, 0-30 V scale) and an ammeter (0.5 degree of precision, 0-5A scale) to the 1-2 sockets of the cable plug connector according to the following diagram:

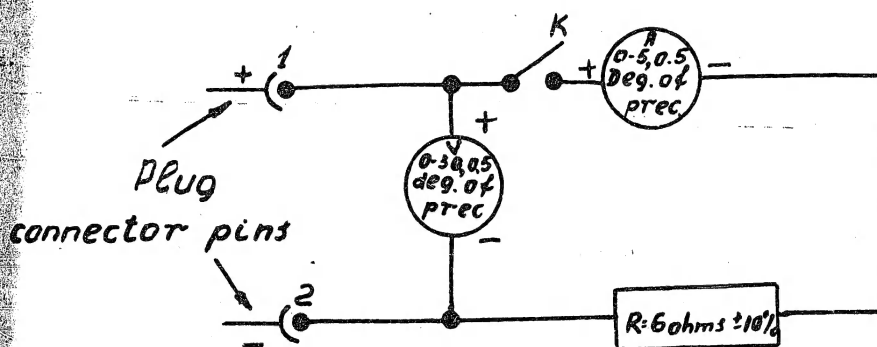


Diagram No.1a

NOTE: If an astatic voltmeter (0.5 degree of precision) is used, disconnect the latter, when checking the ammeter.

c) switch on the "PANEL POWER SUPPLY" switch, this done, the voltmeter pointers should move to the right and difference between their readings should not exceed:

0.9 V for M5-2 voltmeters,

0.6 V for EL-70 voltmeters,

d) close the ammeter circuit by the "K" switch; in this case the ammeter pointers should move to the right and difference between the readings of both ammeters should not exceed:

0.15 A for M5-2 ammeters,

0.1 A for EL-70 ammeters.

2. Check the a.c. voltmeter and ammeter for loading error proceeding as follows:

a) set the phase selector switch to the "1" position;

b) connect a reference ammeter (0.5 degree of precision, 0-1A scale) and a reference voltmeter (0.5 degree of precision, 0-60 V scale) to the 2-4 sockets of the panel plug connector and supply voltage according to the following diagram:

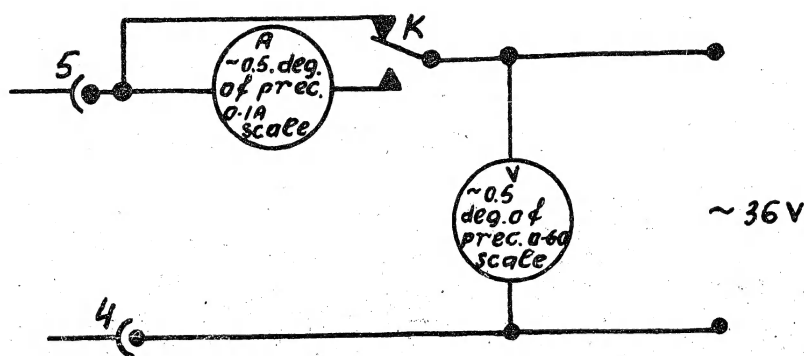


Diagram No. 2.

c) switch on the "LOAD" switch on the panel: the panel ammeter and voltmeter pointers should move to the right.

In this case difference in the readings of the electric instruments should not exceed.

1.0 V for a 0-10 voltmeter,

0.03 ma for a 0-421 ammeter,

0.03 ma for a 0-70 ammeter.

When taking the voltmeter readings, open the ammeter circuit by the "K" switch.

